400TS
400S
300TS
300S

ARCMASTER®
INVERTER ARC WELDERS

Art # A-07263

Service Manual

Revision No: AB **Issue Date:** May 22, 2006 **Manual No**: 0-4882B
Operating Features:

CE

SMAW | GTAW | 1/3 PHASE | 400 AMP | 50/60 Hz | INVERTER | CC | DC | 400 V

THERMAL ARC®

WARNINGS

Read and understand this entire Manual and your employer's safety practices before installing, operating, or servicing the equipment.

While the information contained in this Manual represents the Manufacturer's best judgement, the Manufacturer assumes no liability for its use.

Service Manual Number 0-4882B for:
ArcMaster 400TS CE Inverter Arc Welder Part Number 10-3091
ArcMaster 400S CE Inverter Arc Welder Part Number 10-3095
ArcMaster 300TS CE Inverter Arc Welder Part Number 10-3097
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Record the following information for Warranty purposes:

Where Purchased: _____

Purchase Date: _____

Equipment Serial #: _____

CONTENTS

1 SAFETY INSTRUCTIONS AND WARNINGS

1 Arc Welding Hazards. 1–1
2 PRINCIPAL SAFETY STANDARDS 1–6
3 PRECAUTIONS DE SECURITE EN SOUNDAGE A L'ARC 1–6
4 Dangers relatifs au soudage à l'arc. 1–7
5 PRINCIPAL SAFETY STANDARDS 1–11
6 STATEMENT OF WARRANTY 1–12
7 DECLARATION OF CONFORMIITY 1–13

2 INTRODUCTION

1 How To Use This Manual 2–1
2 Equipment Identification 2–1
3 Receipt Of Equipment 2–1
4 Symbol Chart. 2–2
5 Description 2–3
6 Functional Block Diagrams 2–4
7 Transporting Methods 2–5

3 INSTALLATION

1 Environment 3–1
2 Location. 3–1
3 Electrical Input Connections 3–1
4 Electrical Input Requirement 3–1
5 Input Power 3–2
6 High Frequency Introduction (300/400TS only). 3–3
7 High Frequency Interference (300/400TS only) 3–3
8 Duty Cycle 3–3
9 Specifications 3–4

4 OPERATOR CONTROLS

1 ARC MASTER 300/400TS and 300/400S Controls 4–1
2 Weld Process selection for ARC MASTER 300/400TS and 300/400S 4–2
3 Weld Parameter Descriptions for ARC MASTER 300/400TS and 300/400S 4–3
4 Weld Parameters for ARC MASTER 300/400TS and 300/400S. 4–5
5 Power Source Features. 4–6

5 SET-UP FOR SMAW (STICK) AND GTAW (TIG)

6 SEQUENCE OF OPERATION

1 Stick Welding. 6–1
2 HF TIG Welding (300/400TS only) 6–2
3 Lift TIG Welding. 6–2
4 Slope Mode Sequence(300/400TS only) 6–2
5 Slope Mode with repeat sequence (300/400TS only) 6–3
6 Pulse Controls (300/400TS only) 6–3

7 ROUTINE MAINTENANCE

8 BASIC TROUBLESHOOTING

1 TIG Welding Problems 8–1
2 Stick Welding Problems 8–3
3 Power Source Problems 8–5

9 VOLTAGE REDUCTION DEVICE (VRD)

1 VRD Specification 9–1
2 VRD Maintenance 9–1
3 Switching VRD On/Off 9–2

10 POWER SOURCE ERROR CODE

11 ADVANCED TROUBLESHOOTING

1 System-Level Fault Isolation 11–1
1.1 Opening the Enclosure 11–1
2 Verification and Remedy to the Indicated Error Codes 11–3
2.1 E01 "Over-Temperature at the primary side" 11–3
2.2 E02 "Over-Temperature at the secondary side" 11–4
2.3 E03 "Transformer Over-Current Failure" 11–4
2.4 E04 "Torch Cable Failure" 11–5
2.5 E11 "Main Supply Over Voltage" 11–5
2.6 E12 "Main Supply Under Voltage" 11–5
2.7 E81 "Wrong Main Supply Voltage" 11–5
2.8 E82 "Rated Voltage Selection Circuit abnormality" 11–6
2.9 E83 "Abnormalities in Mains Supply Voltage Detection" 11–6
2.10 E85 "Pre-charge abnormality" 11–6
2.11 E94 "Thermistor malfunction" 11–7
2.12 E99 "Initial Power Receiving" 11–7
3 Verification and Remedy to Failures without Indication Codes 11–7
3.1 "Cooling Fan (FAN1) Failure" (Fan is not rotating.) 11–7
3.2 "Gas Valve Failure" (No Gas flow through unit)(300/400TS only) 11–8
3.3 "No Weld Output" 11–8
3.4 "Operating Panel Failure" (LED's do not light properly or welding setting cannot be established) 11–9
3.5 "High Frequency Output Failure" (Unit does not generate High Frequency.) (300/400TS only) 11–9
4 Fault Isolation Tests 11–10
4.1 Preparation 11–10
5 Verification of the Power Input Circuitry 11–11
5.1 Verification of the AC input voltage using an AC voltmeter 11–11
5.2 Verification of the Power Supply Voltage 11–12
5.3 Verification of the Cooling Fan, FAN1, Drive Circuitry 11–13
5.4 Verification of the Gas Valve, SOL1, Drive Circuitry 11–14
5.5 Verification of the primary Diode (D1) 11–14
5.6 Verification of the secondary Diode (D2-D7) 11–15
5.7 Verification of the primary IGBT (Q1-Q24) 11–15
5.8 Verification of the secondary IGBT (Q25-Q26) 11–16
5.9 Verification of No-load Voltage (OCV) 11–16

12 MAINTENANCE

1 Maintenance List 12–1
2 Service Tools 12–5
2.1 Tools and parts 12–5
2.2 Notes of disassembly and assembly 12–5
3 Replacement Procedure 12–6
3.1 PCB1 (WK-5493) 12–6
3.2 PCB2 (WK-5597) 12–7
3.3 PCB3 (WK-5548), PCB7 (WK-5550) 12–9
3.4 PCB4 (WK-4819) 12–10
3.5 PCB5 (WK-5551) 12–11
3.6 PCB6 (WK-5549) 12–11

CONTENTS

3.7 PCB8, PCB9 (WK-5479) and Q1-Q12 “Primary IGBT” 12–12
3.8 PCB10, PCB11 (WK-5479) and Q13-Q24 “Primary IGBT” 12–12
3.9 PCB12 (WK-5527) 12–12
3.10 PCB13 (WK-5528) 12–13
3.11 PCB14 (WK-5594) <T1 “Main Transformer”> stvy 12–14
3.12 PCB15 (WK-5606) 12–16
3.13 PCB20 (WK-5499) 12–16
3.14 PCB21 (WK-4917) 12–17
3.15 Current Limiting Resistor (R6) 12–18
3.16 Resistor (R7, R8) 12–19
3.17 Coupling Coil (CC1) ∗ 300/400TS only 12–20
3.18 Reactor (FCH1) 12–20
3.19 Primary Thermistor (TH1) 12–21
3.20 Secondary Thermistor (TH2) 12–22
3.21 Cooling Fan (FAN1) 12–22
3.22 Solenoid Valve (SOL1) ∗ 300/400TS only 12–23
3.23 Main ON/OFF Switch (S1) 12–24
3.24 Input Voltage Switch (S2) 12–25
3.25 Remote Socket (CON1) 12–26
3.26 High Freguency Unit (HF.UNIT1) ∗ 300/400TS only 12–26
3.27 Hall Current Sensor (HCT1) 12–27
3.28 Primary Diode (D1) 12–28
3.29 Secondary Diode (D2, D4, D5 and D7) 12–28
3.30 Current Trans (CT2, CT3) 12–29
3.31 Ring Core (L1) 12–30
3.32 Ring Core (L105) 12–30

APPENDIX 1 PARTS LIST

1 Equipment Identification 1
2 How To Use This Parts List 1

APPENDIX 2 CONNECTION WIRING GUIDE

APPENDIX 3 INTERCONNECT DIAGRAM

APPENDIX 4 DIODE TESTING BASICS

SECTION 1:
SAFETY INSTRUCTIONS AND WARNINGS

WARNING

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR. DO NOT LOSE THESE INSTRUCTIONS. READ OPERATING/INSTRUCTION MANUAL BEFORE INSTALLING, OPERATING OR SERVICING THIS EQUIPMENT.

Welding products and welding processes can cause serious injury or death, or damage to other equipment or property, if the operator does not strictly observe all safety rules and take precautionary actions.

Safe practices have developed from past experience in the use of welding and cutting. These practices must be learned through study and training before using this equipment. Some of these practices apply to equipment connected to power lines; other practices apply to engine driven equipment. Anyone not having extensive training in welding and cutting practices should not attempt to weld.

Safe practices are outlined in the American National Standard Z49.1 entitled: SAFETY IN WELDING AND CUTTING. This publication and other guides to what you should learn before operating this equipment are listed at the end of these safety precautions. **HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.**

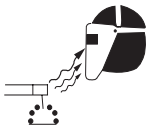
1.01 Arc Welding Hazards

WARNING

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment. Lock input power disconnect switch open, or remove line fuses so power cannot be turned on accidentally.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Turn off all equipment when not in use. Disconnect power to equipment if it will be left unattended or out of service.
7. Use fully insulated electrode holders. Never dip holder in water to cool it or lay it down on the ground or the work surface. Do not touch holders connected to two welding machines at the same time or touch other people with the holder or electrode.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode while in contact with the work (ground) circuit.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. In confined spaces or damp locations, do not use a welder with AC output unless it is equipped with a voltage reducer. Use equipment with DC output.
14. Wear a safety harness to prevent falling if working above floor level.
15. Keep all panels and covers securely in place.



WARNING

ARC RAYS can burn eyes and skin; NOISE can damage hearing. Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

1. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
2. Wear approved safety glasses. Side shields recommended.

3. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved ear plugs or ear muffs if noise level is high.

WARNING

FUMES AND GASES can be hazardous to your health.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breath the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WARNING

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.

Eye protection filter shade selector for welding or cutting (goggles or helmet), from AWS A6.2-73.

Welding or cutting	*Electrode Size*	*Filter*	*Welding or cutting*	*Electrode Size*	*Filter*
Torch soldering		2	**Gas metal-arc**		
Torch brazing		3 or 4	Non-ferrous base metal	All	11
Oxygen Cutting			Ferrous base metal	All	12
Light	Under 1 in., 25 mm	3 or 4	Gas tungsten arc welding	All	12
Medium	1 to 6 in., 25-150 mm	4 or 5	(TIG)	All	12
Heavy	Over 6 in., 150 mm	5 or 6	Atomic hydrogen welding	All	12
Gas welding			Carbon arc welding	All	12
Light	Under 1/8 in., 3 mm	4 or 5	Plasma arc welding		
Medium	1/8 to 1/2 in., 3-12 mm	5 or 6	**Carbon arc air gouging**		
Heavy	Over 1/2 in., 12 mm	6 or 8	Light		12
Shielded metal-arc	Under 5/32 in., 4 mm	10	Heavy		14
	5/32 to 1/4 in.,	12	**Plasma arc cutting**		
	Over 1/4 in., 6.4 mm	14	Light	Under 300 Amp	9
			Medium	300 to 400 Amp	12
			Heavy	Over 400 Amp	14

WARNING

FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.

WARNING

CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. Keep cylinders away from any welding or other electrical circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

WARNING

Engines can be dangerous.

WARNING

ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

WARNING

ENGINE FUEL can cause fire or explosion.

Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank — allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.

WARNING

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect negative (-) battery cable from battery.
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.

WARNING

SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. Do not use welder to charge batteries or jump start vehicles.
5. Observe correct polarity (+ and –) on batteries.

WARNING

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. Wear gloves and put a rag over cap area when removing cap.
3. Allow pressure to escape before completely removing cap.

WARNING

This product, when used for welding or cutting, produces fumes or gases which contain chemicals know to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety code Sec. 25249.5 et seq.)

NOTE

Considerations About Welding And The Effects of Low Frequency Electric and Magnetic Fields

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, Biological Effects of Power Frequency Electric & Magnetic Fields - Background Paper, OTA-BP-E-63 (Washington, DC: U.S. Government Printing Office, May 1989): "...there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cable around the body.
4. Keep welding power source and cables as far away from body as practical.

ABOUT PACEMAKERS:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

1.02 Principal Safety Standards

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33126.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.03 Precautions de Securite en Soudage à l'Arc

MISE EN GARDE

LE SOUDAGE A L'ARC EST DANGEREUX

PROTEGEZ-VOUS, AINSI QUE LES AUTRES, CONTRE LES BLESSURES GRAVES POSSIBLES OU LA MORT. NE LAISSEZ PAS LES ENFANTS S'APPROCHER, NI LES PORTEURS DE STIMULATEUR CARDIAQUE (A MOINS QU'ILS N'AIENT CONSULTE UN MEDECIN). CONSERVEZ CES INSTRUCTIONS. LISEZ LE MANUEL D'OPERATION OU LES INSTRUCTIONS AVANT D'INSTALLER, UTILISER OU ENTRETENIR CET EQUIPEMENT.

Les produits et procédés de soudage peuvent sauser des blessures graves ou la mort, de même que des dommages au reste du matériel et à la propriété, si l'utilisateur n'adhère pas strictement à toutes les règles de sécurité et ne prend pas les précautions nécessaires.

En soudage et coupage, des pratiques sécuritaires se sont développées suite à l'expérience passée. Ces pratiques doivent être apprises par étude ou entraînement avant d'utiliser l'equipement. Toute personne n'ayant pas suivi un entraînement intensif en soudage et coupage ne devrait pas tenter de souder. Certaines pratiques concernent les équipements raccordés aux lignes d'alimentation alors que d'autres s'adressent aux groupes électrogènes.

La norme Z49.1 de l'American National Standard, intitulée "SAFETY IN WELDING AND CUTTING" présente les pratiques sécuritaires à suivre. Ce document ainsi que d'autres guides que vous devriez connaître avant d'utiliser cet équipement sont présentés à la fin de ces instructions de sécurité.

SEULES DES PERSONNES QUALIFIEES DOIVENT FAIRE DES TRAVAUX D'INSTALLATION, DE REPARATION, D'ENTRETIEN ET D'ESSAI.

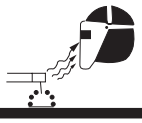
1.04 Dangers Relatifs au Soudage à l'Arc

AVERTISSEMENT

L'ELECTROCUTION PEUT ETRE MORTELLE.

Une décharge électrique peut tuer ou brûler gravement. L'électrode et le circuit de soudage sont sous tension dès la mise en circuit. Le circuit d'alimentation et les circuits internes de l'équipement sont aussi sous tension dès la mise en marche. En soudage automatique ou semi-automatique avec fil, ce dernier, le rouleau ou la bobine de fil, le logement des galets d'entrainement et toutes les pièces métalliques en contact avec le fil de soudage sont sous tension. Un équipement inadéquatement installé ou inadéquatement mis à la terre est dangereux.

1. Ne touchez pas à des pièces sous tension.
2. Portez des gants et des vêtements isolants, secs et non troués.
3 Isolez-vous de la pièce à souder et de la mise à la terre au moyen de tapis isolants ou autres.
4. Déconnectez la prise d'alimentation de l'équipement ou arrêtez le moteur avant de l'installer ou d'en faire l'entretien. Bloquez le commutateur en circuit ouvert ou enlevez les fusibles de l'alimentation afin d'éviter une mise en marche accidentelle.
5. Veuillez à installer cet équipement et à le mettre à la terre selon le manuel d'utilisation et les codes nationaux, provinciaux et locaux applicables.
6. Arrêtez tout équipement après usage. Coupez l'alimentation de l'équipement s'il est hors d'usage ou inutilisé.
7. N'utilisez que des porte-électrodes bien isolés. Ne jamais plonger les porte-électrodes dans l'eau pour les refroidir. Ne jamais les laisser traîner par terre ou sur les pièces à souder. Ne touchez pas aux porte-électrodes raccordés à deux sources de courant en même temps. Ne jamais toucher quelqu'un d'autre avec l'électrode ou le porte-électrode.
8. N'utilisez pas de câbles électriques usés, endommagés, mal épissés ou de section trop petite.
9. N'enroulez pas de câbles électriques autour de votre corps.
10. N'utilisez qu'une bonne prise de masse pour la mise à la terre de la pièce à souder.
11. Ne touchez pas à l'électrode lorsqu'en contact avec le circuit de soudage (terre).
12. N'utilisez que des équipements en bon état. Réparez ou remplacez aussitôt les pièces endommagées.
13. Dans des espaces confinés ou mouillés, n'utilisez pas de source de courant alternatif, à moins qu'il soit muni d'un réducteur de tension. Utilisez plutôt une source de courant continu.
14. Portez un harnais de sécurité si vous travaillez en hauteur.
15. Fermez solidement tous les panneaux et les capots.



AVERTISSEMENT

LE RAYONNEMENT DE L'ARC PEUT BRÛLER LES YEUX ET LA PEAU; LE BRUIT PEUT ENDOMMAGER L'OUIE.

L'arc de soudage produit une chaleur et des rayons ultraviolets intenses, susceptibles de brûler les yeux et la peau. Le bruit causé par certains procédés peut endommager l'ouïe.

1. Portez une casque de soudeur avec filtre oculaire de nuance appropriée (consultez la norme ANSI Z49 indiquée ci-après) pour vous protéger le visage et les yeux lorsque vous soudez ou que vous observez l'exécution d'une soudure.
2. Portez des lunettes de sécurité approuvées. Des écrans latéraux sont recommandés.
3. Entourez l'aire de soudage de rideaux ou de cloisons pour protéger les autres des coups d'arc ou de l'éblouissement; avertissez les observateurs de ne pas regarder l'arc.
4. Portez des vêtements en matériaux ignifuges et durables (laine et cuir) et des chaussures de sécurité.
5. Portez un casque antibruit ou des bouchons d'oreille approuvés lorsque le niveau de bruit est élevé.

AVERTISSEMENT

LES VAPEURS ET LES FUMEES SONT DANGEREUSES POUR LA SANTE.

Le soudage dégage des vapeurs et des fumées dangereuses à respirer.

1. Eloignez la tête des fumées pour éviter de les respirer.
2. A l'intérieur, assurez-vous que l'aire de soudage est bien ventilée ou que les fumées et les vapeurs sont aspirées à l'arc.
3. Si la ventilation est inadequate, portez un respirateur à adduction d'air approuvé.
4. Lisez les fiches signalétiques et les consignes du fabricant relatives aux métaux, aux produits consummables, aux revêtements et aux produits nettoyants.
5. Ne travaillez dans un espace confiné que s'il est bien ventilé; sinon, portez un respirateur à adduction d'air. Les gaz protecteurs de soudage peuvent déplacer l'oxygène de l'air et ainsi causer des malaises ou la mort. Assurez-vous que l'air est propre à la respiration.
6. Ne soudez pas à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir avec des vapeurs et former des gaz hautement toxiques et irritants.

SELECTION DES NUANCES DE FILTRES OCULAIRS POUR LA PROTECTION DES YEUX EN COUPAGE ET SOUDAGE (selon AWS á 8.2-73)

Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire	Opération de coupage ou soudage	Dimension d'électrode ou Epiasseur de métal ou Intensité de courant	Nuance de filtre oculaire
Brassage tendre au chalumeau	toutes conditions	2	Soudage á l'arc sous gaz avec fil plein (GMAW)		
Brassage fort au chalumeau	toutes conditions	3 ou 4	métaux non-ferreux	toutes conditions	11
Oxycoupage			métaux ferreux	toutes conditions	12
mince	moins de 1 po. (25 mm)	3 ou 4	Soudage á l'arc sous gaz avec électrode de tungstène (GTAW)	toutes conditions	12
moyen	de 1 á 6 po. (25 á 150 mm)	4 ou 5	Soudage á l'hydrogène atomique (AHW)	toutes conditions	12
épais	plus de 6 po. (150 mm)	5 ou 6	Soudage á l'arc avec électrode de carbone (CAW)	toutes conditions	12
Soudage aux gaz			Soudage á l'arc Plasma (PAW)	toutes dimensions	12
mince	moins de 1/8 po. (3 mm)	4 ou 5	Gougeage Air-Arc avec électrode de carbone		
moyen	de 1/8 á 1/2 po. (3 á 12 mm)	5 ou 6	mince		12
épais	plus de 1/2 po. (12 mm)	6 ou 8	épais		14
Soudage á l'arc avec électrode enrobees (SMAW)	moins de 5/32 po. (4 mm)	10	Coupage á l'arc Plasma (PAC)		
	5/32 á 1/4 po. (4 á 6.4 mm)	12	mince	moins de 300 amperès	9
	plus de 1/4 po. (6.4 mm)	14	moyen	de 300 á 400 amperès	12
			épais	plus de 400 amperès	14

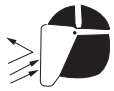
7. Ne soudez des tôles galvanisées ou plaquées au plomb ou au cadmium que si les zones à souder ont été grattées à fond, que si l'espace est bien ventilé; si nécessaire portez un respirateur à adduction d'air. Car ces revêtements et tout métal qui contient ces éléments peuvent dégager des fumées toxiques au moment du soudage.

AVERTISSEMENT

LE SOUDAGE PEUT CAUSER UN INCENDIE OU UNE EXPLOSION

L'arc produit des étincellies et des projections. Les particules volantes, le métal chaud, les projections de soudure et l'équipement surchauffé peuvent causer un incendie et des brûlures. Le contact accidentel de l'électrode ou du fil-électrode avec un objet métallique peut provoquer des étincelles, un échauffement ou un incendie.

1. Protégez-vous, ainsi que les autres, contre les étincelles et du métal chaud.
2. Ne soudez pas dans un endroit où des particules volantes ou des projections peuvent atteindre des matériaux inflammables.
3. Enlevez toutes matières inflammables dans un rayon de 10, 7 mètres autour de l'arc, ou couvrez-les soigneusement avec des bâches approuvées.
4. Méfiez-vous des projections brulantes de soudage susceptibles de pénétrer dans des aires adjacentes par de petites ouvertures ou fissures.
5. Méfiez-vous des incendies et gardez un extincteur à portée de la main.
6. N'oubliez pas qu'une soudure réalisée sur un plafond, un plancher, une cloison ou une paroi peut enflammer l'autre côté.
7. Ne soudez pas un récipient fermé, tel un réservoir ou un baril.
8. Connectez le câble de soudage le plus près possible de la zone de soudage pour empêcher le courant de suivre un long parcours inconnu, et prévenir ainsi les risques d'électrocution et d'incendie.
9. Ne dégelez pas les tuyaux avec un source de courant.
10. Otez l'électrode du porte-électrode ou coupez le fil au tube-contact lorsqu'inutilisé après le soudage.
11. Portez des vêtements protecteurs non huileux, tels des gants en cuir, une chemise épaisse, un pantalon revers, des bottines de sécurité et un casque.



AVERTISSEMENT

LES ETINCELLES ET LES PROJECTIONS BRULANTES PEUVENT CAUSER DES BLESSURES.

Le piquage et le meulage produisent des particules métalliques volantes. En refroidissant, la soudure peut projeter du éclats de laitier.

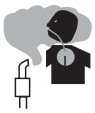
1. Portez un écran facial ou des lunettes protectrices approuvées. Des écrans latéraux sont recommandés.
2. Portez des vêtements appropriés pour protéger la peau.

AVERTISSEMENT

LES BOUTEILLES ENDOMMAGEES PEUVENT EXPLOSER

Les bouteilles contiennent des gaz protecteurs sous haute pression. Des bouteilles endommagées peuvent exploser. Comme les bouteilles font normalement partie du procédé de soudage, traitez-les avec soin.

1. Protégez les bouteilles de gaz comprimé contre les sources de chaleur intense, les chocs et les arcs de soudage.
2. Enchainez verticalement les bouteilles à un support ou à un cadre fixe pour les empêcher de tomber ou d'être renversées.
3. Eloignez les bouteilles de tout circuit électrique ou de tout soudage.
4. Empêchez tout contact entre une bouteille et une électrode de soudage.
5. N'utilisez que des bouteilles de gaz protecteur, des détendeurs, des boyauxs et des raccords conçus pour chaque application spécifique; ces équipements et les pièces connexes doivent être maintenus en bon état.
6. Ne placez pas le visage face à l'ouverture du robinet de la bouteille lors de son ouverture.
7. Laissez en place le chapeau de bouteille sauf si en utilisation ou lorsque raccordé pour utilisation.
8. Lisez et respectez les consignes relatives aux bouteilles de gaz comprimé et aux équipements connexes, ainsi que la publication P-1 de la CGA, identifiée dans la liste de documents ci-dessous.



AVERTISSEMENT

LES MOTEURS PEUVENT ETRE DANGEREUX

LES GAZ D'ECHAPPEMENT DES MOTEURS PEUVENT ETRE MORTELS.

Les moteurs produisent des gaz d'échappement nocifs.

1. Utilisez l'équipement à l'extérieur dans des aires ouvertes et bien ventilées.
2. Si vous utilisez ces équipements dans un endroit confiné, les fumées d'échappement doivent être envoyées à l'extérieur, loin des prises d'air du bâtiment.

AVERTISSEMENT

LE CARBURANT PEUR CAUSER UN INCENDIE OU UNE EXPLOSION.

Le carburant est hautement inflammable.

1. Arrêtez le moteur avant de vérifier le niveau e carburant ou de faire le plein.
2. Ne faites pas le plein en fumant ou proche d'une source d'étincelles ou d'une flamme nue.
3. Si c'est possible, laissez le moteur refroidir avant de faire le plein de carburant ou d'en vérifier le niveau au début du soudage.
4. Ne faites pas le plein de carburant à ras bord: prévoyez de l'espace pour son expansion.
5. Faites attention de ne pas renverser de carburant. Nettoyez tout carburant renversé avant de faire démarrer le moteur.

AVERTISSEMENT

DES PIECES EN MOUVEMENT PEUVENT CAUSER DES BLESSURES.

Des pièces en mouvement, tels des ventilateurs, des rotors et des courroies peuvent couper doigts et mains, ou accrocher des vêtements amples.

1. Assurez-vous que les portes, les panneaux, les capots et les protecteurs soient bien fermés.
2. Avant d'installer ou de connecter un système, arrêtez le moteur.
3. Seules des personnes qualifiées doivent démonter des protecteurs ou des capots pour faire l'entretien ou le dépannage nécessaire.
4. Pour empêcher un démarrage accidentel pendant l'entretien, débranchez le câble d'accumulateur à la borne négative.
5. N'approchez pas les mains ou les cheveux de pièces en mouvement; elles peuvent aussi accrocher des vêtements amples et des outils.
6. Réinstallez les capots ou les protecteurs et fermez les portes après des travaux d'entretien et avant de faire démarrer le moteur.

AVERTISSEMENT

DES ETINCELLES PEUVENT FAIRE EXPLOSER UN ACCUMULATEUR; L'ELECTROLYTE D'UN ACCUMULATEUR PEUT BRULER LA PEAU ET LES YEUX.

Les accumulateurs contiennent de l'électrolyte acide et dégagent des vapeurs explosives.

1. Portez toujours un écran facial en travaillant sur un accumu-lateur.
2. Arrêtez le moteur avant de connecter ou de déconnecter des câbles d'accumulateur.
3. N'utilisez que des outils anti-étincelles pour travailler sur un accumulateur.
4. N'utilisez pas une source de courant de soudage pour charger un accumulateur ou survolter momentanément un véhicule.
5. Utilisez la polarité correcte (+ et –) de l'accumulateur.

AVERTISSEMENT

LA VAPEUR ET LE LIQUIDE DE REFROIDISSEMENT BRULANT SOUS PRESSION PEUVENT BRULER LA PEAU ET LES YEUX.

Le liquide de refroidissement d'un radiateur peut être brûlant et sous pression.

1. N'ôtez pas le bouchon de radiateur tant que le moteur n'est pas refroidi.
2. Mettez des gants et posez un torchon sur le bouchon pour l'ôter.
3. Laissez la pression s'échapper avant d'ôter complètement le bouchon.

1.05 Principales Normes de Securite

Safety in Welding and Cutting, norme ANSI Z49.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

Safety and Health Standards, OSHA 29 CFR 1910, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, norme AWS F4.1, American Welding Society, 550 N.W. LeJeune Rd., Miami, FL 33128.

National Electrical Code, norme 70 NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, document P-1, Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, norme CSA W117.2 Association canadienne de normalisation, Standards Sales, 276 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices for Occupation and Educational Eye and Face Protection, norme ANSI Z87.1, American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting and Welding Processes, norme 51B NFPA, National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

1.06 Declaration Of Conformity

CE

Manufacturer: Thermadyne Corporation
Address: 82 Benning Street
West Lebanon, New Hampshire 03784
USA

The equipment described in this manual conforms to all applicable aspects and regulations of the 'Low Voltage Directive' (European Council Directive 73/23/EEC as amended by Council Directive 93/68/EEC) and to the National legislation for the enforcement of this Directive.

The equipment described in this manual conforms to all applicable aspects and regulations of the "EMC Directive" (European Council Directive 89/336/EEC) and to the National legislation for the enforcement of this Directive.

Serial numbers are unique with each individual piece of equipment and details description, parts used to manufacture a unit and date of manufacture.

National Standard and Technical Specifications

The product is designed and manufactured to a number of standards and technical requirements. Among them are:

- CSA (Canadian Standards Association) standard C22.2 number 60 for Arc welding equipment.
- UL (Underwriters Laboratory) rating 94VO flammability testing for all printed-circuit boards used.
- CENELEC EN50199 EMC Product Standard for Arc Welding Equipment.
- ISO/IEC 60974-1 (BS 638-PT10) (EN 60 974-1) (EN50192) (EN50078) applicable to plasma cutting equipment and associated accessories.
- For environments with increased hazard of electrical shock, Power Supplies bearing the S mark conform to EN50192 when used in conjunction with hand torches with exposed cutting tips, if equipped with properly installed standoff guides.
- Extensive product design verification is conducted at the manufacturing facility as part of the routine design and manufacturing process. This is to ensure the product is safe, when used according to instructions in this manual and related industry standards, and performs as specified. Rigorous testing is incorporated into the manufacturing process to ensure the manufactured product meets or exceeds all design specifications.

Thermadyne has been manufacturing products for more than 30 years, and will continue to achieve excellence in our area of manufacture.

Manufacturers responsible representative:

Steve Ward
Operations Director
Thermadyne Europe
Europa Building
Chorley N Industrial Park
Chorley, Lancashire,
England PR6 7BX

2 INTRODUCTION

1 How To Use This Manual

This Service Manual applies to just specification or part numbers listed on page i.

To ensure safe operation, read the entire manual, including the chapter on safety instructions and warnings.

Throughout this manual, the words **WARNING**, **CAUTION**, and **NOTE** may appear. Pay particular attention to the information provided under these headings. These special annotations are easily recognized as follows:

WARNING

A WARNING gives information regarding possible personal injury.

CAUTION

A CAUTION refers to possible equipment damage.

NOTE

A NOTE offers helpful information concerning certain operating procedures.

Additional copies of this manual may be purchased by contacting Thermal Arc at the address and phone number in your area listed in the inside back cover of this manual. Include the manual number and equipment identification numbers.

Electronic copies of this manual can also be downloaded at no charge in Acrobat PDF format by going to the Thermal Arc web site listed below and clicking on the Literature Library link:

http://www.thermalarc.com

2 Equipment Identification

The unit's identification number (specification or part number), model, and serial number usually appear on a nameplate attached to the control panel. In some cases, the nameplate may be attached to the rear panel. Equipment which does not have a control panel such as gun and cable assemblies is identified only by the specification or part number printed on the shipping container. Record these numbers on the bottom of page i for future reference.

3 Receipt Of Equipment

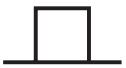
When you receive the equipment, check it against the invoice to make sure it is complete and inspect the equipment for possible damage due to shipping. If there is any damage, notify the carrier immediately to file a claim. Furnish complete information concerning damage claims or shipping errors to the location in your area listed in the inside back cover of this manual.

Include all equipment identification numbers as described above along with a full description of the parts in error.

Move the equipment to the installation site before uncrating the unit. Use care to avoid damaging the equipment when using bars, hammers, etc., to uncrate the unit.

4 Symbol Chart

Note that only some of these symbols will appear on your model.

A	Amperage
V	Voltage
Hz	Hertz (frequency)
SEC	Seconds
%	Percent
⎓	DC (Direct Current)
~	AC (Alternating Current)
	Standard Function
	Slope Function
	Slope W/Repeat Function
	Spot Function
	Impulse Starting (High Frequency GTAW)
	Touch Start (Lift Start TIG circuit GTAW)

	STICK (Shielded Metal Arc SMAW)
	Pulse Current Function
	Spot Time (GTAW)
	Remote Control (Panel/Remote)
	Remote Function
	Arc Control (SMAW)
	Gas Post-Flow
	Gas Pre-Flow
VRD	Voltage Reduction Device Circuit
—	Negative
+	Positive
	Gas Input
	Gas Output

5 Description

The Thermal Arc™ Model ARC MASTER 300TS and 400TS is a single/three-phase DC arc welding power source with Constant Current (CC) output characteristics. This unit is equipped with a Digital Volt/Amperage Meter, gas control valve, built in Sloper and Pulser, lift arc starter, and high-frequency arc starter for use with Gas Tungsten Arc Welding (GTAW), Gas Tungsten Arc Welding-Pulse (GTAW-P), Gas Tungsten Arc Welding-Sloped (GTSW-S), and Shielded Metal Arc Welding (SMAW) processes. The power source is totally enclosed in an impact resistant, flame resistant and non-conductive plastic case.

The Thermal Arc™ Model ARCMASTER 300S and 400S is a self contained single/three-phase DC arc welding power source with Constant Current (CC) output characteristics. This unit is equipped with a Digital Volt/Amperage Meter and lift arc starter for use with Gas Tungsten Arc Welding (GTAW) and Shielded Metal Arc Welding (SMAW) processes. The power source is totally enclosed in an impact resistant, flame resistant and non-conductive plastic case.

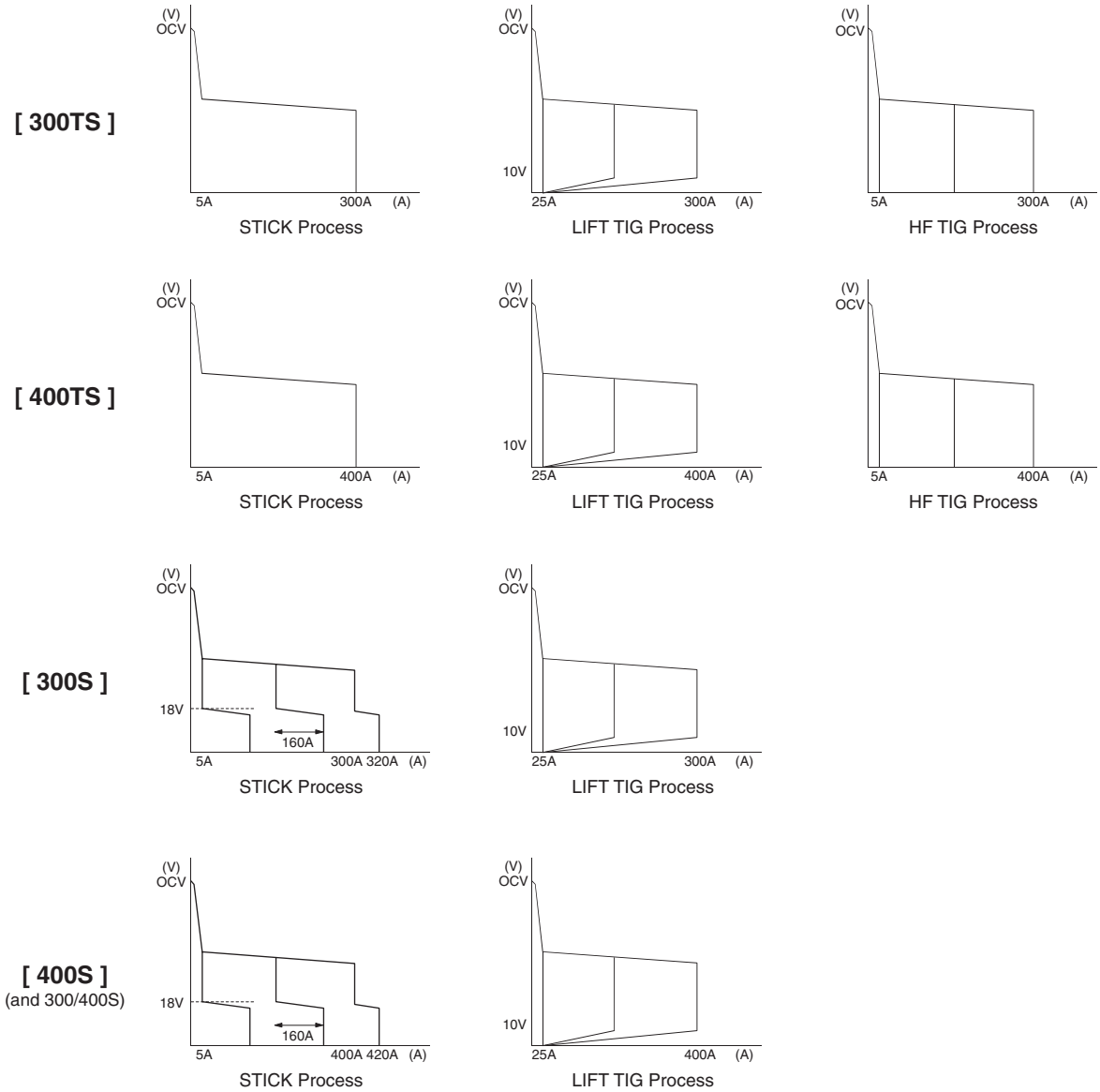


Figure 2-1: 300/400TS Volt-Ampere curve

6 Functional Block Diagrams

Figure 2-2 illustrates the functional block diagram of the 300TS and 400TS power supply. Figure 2-3 illustrates the functional block diagram of the 300S and 400S power supply.

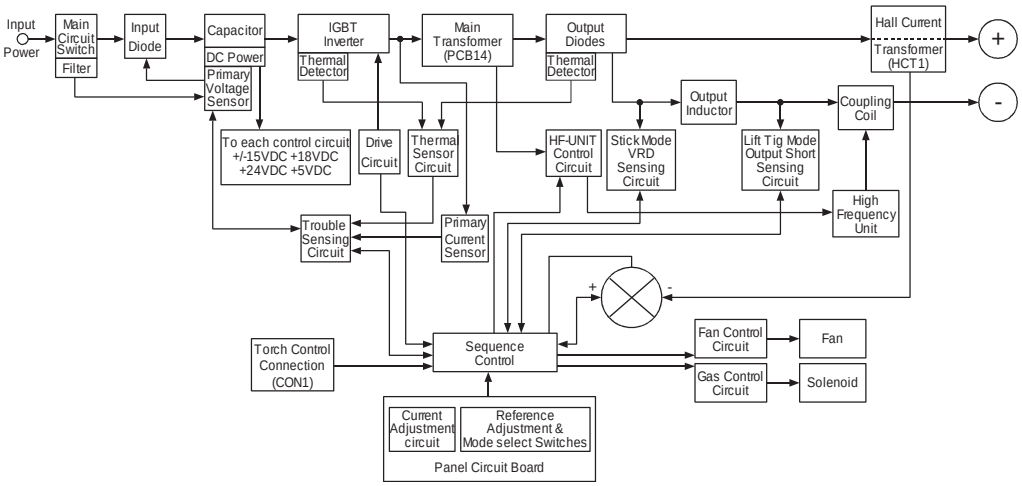


Figure 2-2: 300/400TS Model Functional Block Diagram

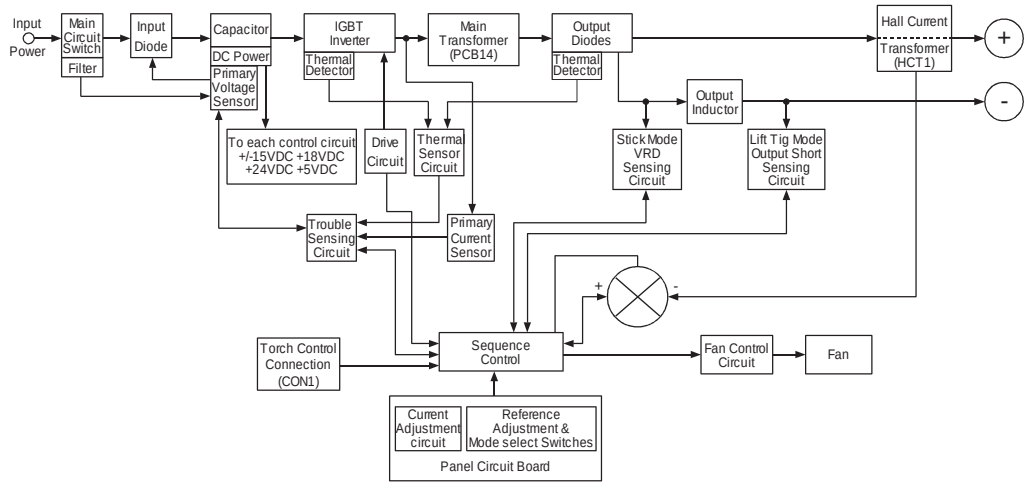


Figure 2-3: 300/400S Model Functional Block Diagram

7 Transporting Methods

These units are equipped with a handle for carrying purposes.

WARNING

ELECTRIC SHOCK can kill.

- DO NOT TOUCH live electrical parts.
- Disconnect input power conductors from de-energized supply line before moving the welding power source.

WARNING

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Lift unit with handle on top of case.
- Use handcart or similar device of adequate capacity.
- If using a fork lift vehicle, place and secure unit on a proper skid before transporting.

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3 INSTALLATION

1 Environment

The ARC MASTER 300/400TS and 300/400S is designed for use in adverse environments.

Examples of environments with increased adverse conditions are:

a. In locations in which freedom of movement is restricted, so that the operator is forced to perform the work in a cramped (kneeling, sitting or lying) position with physical contact with conductive parts;

b. In locations which are fully or partially limited by conductive elements, and in which there is a high risk of unavoidable or accidental contact by the operator, or

c. In wet or damp hot locations where humidity or perspiration considerably reduces the skin resistance of the human body and the insulation properties of accessories.

Environments with adverse conditions do not include places where electrically conductive parts are in the near vicinity of the operator, which can cause increased hazard, have been insulated.

2 Location

Be sure to locate the welder according to the following guidelines:

- In areas, free from moisture and dust.
- Ambient temperature between 0 degrees C to 40 degrees C.
- In areas, free from oil, steam and corrosive gases.
- In areas, not subjected to abnormal vibration or shock.
- In areas, not exposed to direct sunlight or rain.
- Place at a distance of 12" (304.79mm) or more from walls or similar boundaries that could restrict natural airflow for cooling.

WARNING

Thermal Arc advises that this equipment be electrically connected by a qualified electrician.

3 Electrical Input Connections

WARNING

ELECTRIC SHOCK can kill; SIGNIFICANT DC VOLTAGE is present after removal of input power.

DO NOT TOUCH live electrical parts.

SHUT DOWN welding power source, disconnect input power employing lockout/tagging procedures. Lockout/tagging procedures consist of padlocking line disconnect switch in open position, removing fuses from fuse box, or shutting off and red-tagging circuit breaker or other disconnecting device.

4 Electrical Input Requirement

Operate the welding power source from a single-phase 50/60 Hz, AC power supply. The input voltage must match one of the electrical input voltages shown on the input data label on the unit nameplate. Contact the local electric utility for information about the type of electrical service available, how proper connections should be made, and any inspection required.

The line disconnect switch provides a safe and convenient means to completely remove all electrical power from the welding power supply whenever necessary to inspect or service the unit.

NOTE

These units are equipped with a three-conductor with earth power cable that is connected at the welding power source end for single and three phase electrical input power.

Do not connect an input (BROWN or BLUE or GRAY) conductor to the ground terminal.

Do not connect the ground (GREEN/YELLOW) conductor to an input line terminal.

Refer to figure 3 and:

1. Connect end of ground (GREEN/YELLOW) conductor to a suitable ground. Use a grounding method that complies with all applicable electrical codes.
2. Connect ends of line 1 (BROWN) and line 2 (BLUE) and line 3 (GRAY) input conductors to a de-energized line disconnect switch.
3. Use Table 3-1 and Table 3-2 as a guide to select line fuses for the disconnect switch.

Input Voltage	Fuse Size
400V	60 Amps

Table 3-1: Electrical Input Connections

NOTE

Fuse size is based on not more than 200 percent of the rated input amperage of the welding power source (Based on Article 630, National Electrical Code).

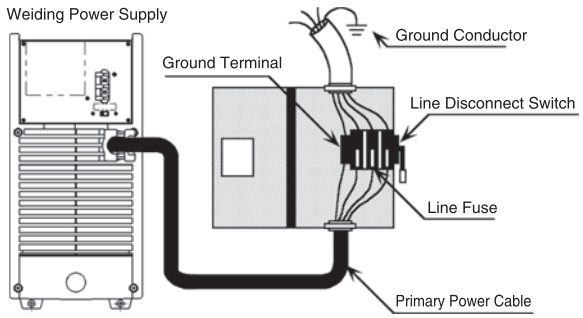


Figure 3-1: Electrical Input Connections

5 Input Power

Each unit incorporates an INRUSH circuit and input voltage sensing circuit. When the MAIN CIRCUIT SWITCH is turned on, the inrush circuit provides a pre-charging of the input capacitors. At this point the Bus Voltages are checked and the welder is enabled after the input capacitors have charged to full operating voltage (after approximately 5 seconds).

NOTE

Note the available input power. Damage to the welder could occur if 575VAC or higher is applied.

The following 400V Primary Current recommendations are required to obtain the maximum welding current and duty cycle from this welding equipment:

Model	Primary Supply Lead Size (Factory Fitted)	Minimum Primary Current Circuit Size (Vin/Amps)		Current & Duty Cycle	
				TIG	STICK
ARC MASTER 300TS/S	4mm sq / 4minimum	3ϕ	400/16	300A @ 40%	–
			400/24	–	300A @ 40%
ARC MASTER 400TS/S			400/26	400A @ 25%	–
			400/35	–	400A @ 25%

Table 3-2:
400V Primary Current Circuit sizes to achieve maximum current

The ARC MASTER 300/400TS and 300/400S is designed for use with a generator as an input power source. Contact an accredited Thermal Arc service agent for the proper sizing and set-up recommendations of a generator power source system. As a general rule, depending on the type of generator used, the generator capacity should be twice the maximum rating of the welder.

6 High Frequency Introduction (300/400TS only)

The importance of correct installation of high frequency welding equipment cannot be over-emphasized. Interference due to high frequency initiated or stabilized arc is almost invariably traced to improper installation. The following information is intended as a guide for personnel installing high frequency welding machines.

WARNING: Explosives

The high frequency section of this machine has an output similar to a radio transmitter. The machine should NOT be used in the vicinity of blasting operations due to the danger of premature firing.

WARNING: Computers

It is also possible that operation close to computer installations may cause computer malfunction.

7 High Frequency Interference (300/400TS only)

Interference may be transmitted by a high frequency initiated or stabilized arc welding machine in the following ways:

1. **Direct Radiation:** Radiation from the machine can occur if the case is metal and is not properly grounded. It can occur through apertures such as open access panels. The shielding of the high frequency unit in the Power Source will prevent direct radiation if the equipment is properly grounded.
2. **Transmission via the Supply Lead:** Without adequate shielding and filtering, high frequency energy may be fed to the wiring within the installation (mains) by direct coupling. The energy is then transmitted by both radiation and conduction. Adequate shielding and filtering is provided in the Power Source.
3. **Radiation from Welding Leads:** Radiated interference from welding leads, although pronounced in the vicinity of the leads, diminishes rapidly with distance. Keeping leads as short as possible will minimize this type of interference. Looping and suspending of leads should be avoided where possible.
4. **Re-radiation from Unearthed Metallic Objects:** A major factor contributing to interference is re-radiation from unearthed metallic objects close to the welding leads. Effective grounding of such objects will prevent re-radiation in most cases.

8 Duty Cycle

The duty cycle of a welding power source is the percentage of a ten (10) minute period that it can be operated at a given output without causing overheating and damage to the unit. If the welding amperes decrease, the duty cycle increases. If the welding amperes are increased beyond the rated output, the duty cycle will decrease.

WARNING

Exceeding the duty cycle ratings will cause the thermal overload protection circuit to become energized and shut down the output until the unit has cooled to normal operating temperature.

CAUTION

Continually exceeding the duty cycle ratings can cause damage to the welding power source and will void the manufactures warranty.

NOTE

Due to variations that can occur in manufactured products, claimed performance, voltages, ratings, all capacities, measurements, dimensions and weights quoted are approximate only. Achievable capacities and ratings in use and operation will depend upon correct installation, use, applications, maintenance and service.

9 Specifications

Parameter		300TS / 300S	400TS / 400S
Rated Output		400VAC	400VAC
Amperes		300	400
Volts		32	36
Duty Cycle		40%	25%
Duty Cycle	TIG	300A / 22V @ 40% (3ph) 250A / 20V @ 60% (3ph) 180A / 18V @ 100% (3ph)	400A / 26V @ 25% (3ph) 300A / 22V @ 60% (3ph) 200A / 18V @ 100% (3ph)
	STICK	300A / 22V @ 40% (3ph) 250A / 20V @ 60% (3ph) 180A / 18V @ 100% (3ph)	400A / 26V @ 25% (3ph) 300A / 22V @ 60% (3ph) 200A / 18V @ 100% (3ph)
Output Current Range		5 - 300 Amps	5 - 400 Amps
Open Circuit Voltage		57V	
Dimensions			
Width		8.3" (210mm)	
Height		16.5" (420mm)	
Length		17.7" (450mm)	
Weight		52.9 lb. 24 kg (300/400TS) 44.1 lb. 20 kg (300/400S)	
Output @ Rated Load		Three-phase	Three-phase
Output Amperes		300A	400A
Output Volts		32V	36V
Duty Cycle		40%	25%
KVA		18.0	24.0
KW		12.0	18.0
Output @ No Load			
KVA		0.5	
KW		0.13	
Input Volts Three Phase		Amperage Draw @ Rated Load	No Load	Amperage Draw @ Rated Load	No Load
400V		24	0.7	35	0.7

Thermal Arc continuously strives to produce the best product possible and therefore reserves the right to change, improve or revise the specifications or design of this or any product without prior notice. Such updates or changes do not entitle the buyer of equipment previously sold or shipped to the corresponding changes, updates, improvements or replacement of such items.

The values specified in the table above are optimal values, your values may differ. Individual equipment may differ from the above specifications due to in part, but not exclusively, to any one or more of the following; variations or changes in manufactured components, installation location and conditions and local power grid supply conditions.

4 OPERATOR CONTROLS

1 ARC MASTER 300/400TS and 300/400S Controls

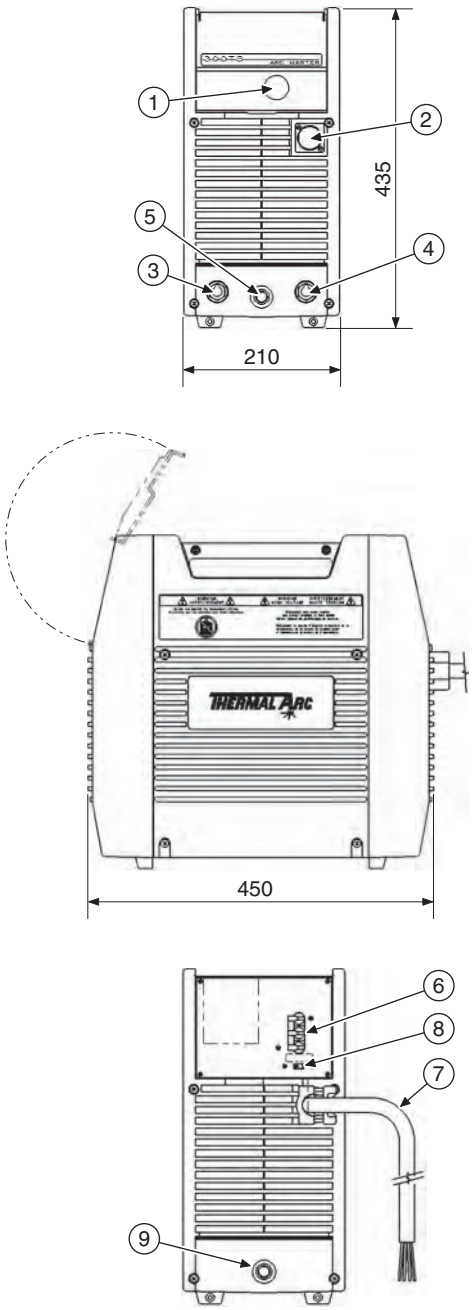


Figure 4-1: ARC MASTER Power Source

1. **Control Knob:** This control sets the selected weld parameter, rotating it clockwise increases the parameter that is indicated on the digital meter. Pushing the knob inward displays the actual welding voltage.
2. **Remote Control Socket:** The 14 pin Remote Control Socket is used to connect remote current control devices to the welding Power Source. To make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

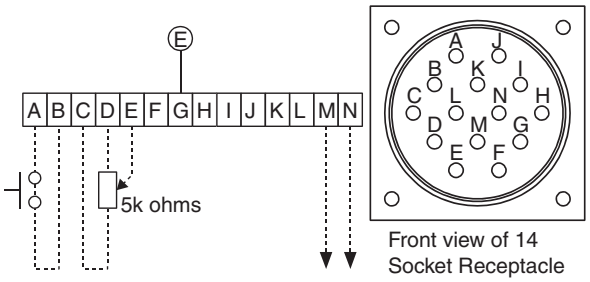


Figure 4-2: 14-Socket Receptacle

Socket Pin	Function
A	Torch Switch Input (24V) to (connect pins A & B to turn on welding current).
B	Torch Switch Input (0V) to energize weld current (connect pins A & B to turn on welding current).
C	5k ohm (maximum) connection to 5k ohm remote control potentiometer.
D	Zero ohm (minimum) connection to 5k ohm remote control potentiometer.
E	Wiper arm connection to 5k ohm remote control potentiometer.
G	Mains Earth.
F,H,I,J, K,L	Not Used.
M	OK to move current detect signal for robotics applications.
N	OK to move current detect signal for robotics applications.

Table 4-1: Socket Pin Functions

3. **Positive Terminal:** Welding current flows from the Power Source via heavy duty Dinse type terminal (50 mm). It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.
4. **Negative Terminal:** Welding current flows from the Power Source via heavy duty Dinse type terminal (50 mm). It is essential, however, that the male plug is inserted and turned securely to achieve a sound electrical connection.

CAUTION

Loose welding terminal connections can cause overheating and result in the male plug being fused in the bayonet terminal.

5. **Torch / Gas Terminal:** Torch / Gas Terminal is an all-in-one design of the Gas Outlet and the Negative Terminal. Gas Outlet is a BSP-3/8 inch female gas fitting. (**300/400TS only)**
6. **ON/OFF Switch:** This switch connects the Primary supply voltage to the inverter when in the ON position. This enables the Power Supply.

WARNING

When the welder is connected to the Primary supply voltage, the internal electrical components maybe at 240V potential with respect to earth.

7. **Input Cable:** The input cable connects the Primary supply voltage to the equipment.
8. **SMART Logic Switch:** Manual slide switch mounted on the back panel selects the proper input voltage. If this slide is not set to the position that matches the input voltage from the electrical source the Smart Logic circuit will inhibit welding power source output. The digital meter will show primary input error code.
9. **Gas Inlet:** The Gas Inlet is a BSP-3/8 inch female gas fitting. **(300/400TS only)**

2 Weld Process selection for ARC MASTER 300/400TS and 300/400S

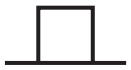
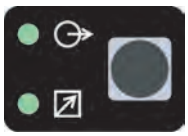
Weld Process Selection	Weld Mode			Description
	STICK	HF TIG	LIFT TIG	
 STD	Yes	Yes	Yes	2T operation in TIG Modes using remote devices to control contactor & current.
SLOPE	No	Yes	Yes	4T operation in TIG Modes with crater fill using a remote contactor device to control sequence. **(300/400TS only)**
REPEAT	No	Yes	Yes	4T operation in TIG Modes with repeat operation and crater fill using a remote contactor device. **(300/400TS only)**
SPOT	No	Yes	No	2T operation spot welding in HF TIG using a remote contactor device. **(300/400TS only)**
PULSE ON/OFF	No	Yes	Yes	Pulse operation in TIG Modes. **(300/400TS only)**
 Contactor ON/OFF	Yes	No	Yes	Contactor operation in Stick Mode
Operation PANEL / REMOTE	Yes	Yes	Yes	Selects mode of Operation: Panel or Remote

Table 4-2:
Weld Process selection verses Weld Mode for ARC MASTER 300/400TS and 300/400S

3 Weld Parameter Descriptions for ARC MASTER 300/400TS and 300/400S

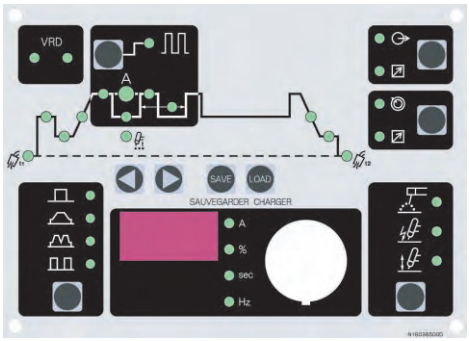


Figure 4-3:
ARC MASTER 300/400TS
Front Panel with Parameter Description

Parameter	Description
t1 PRE-FLOW	This parameter operates in TIG modes only and is used to provide gas to the weld zone prior to striking the arc, once the torch trigger switch has been pressed. This control is used to dramatically reduce weld porosity at the start of a weld.
HOT START	This parameter operates in all weld modes except Lift TIG mode and is used to heat up the weld zone in TIG modes or improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the BASE (WELD) current. e.g. HOT START current = 130 amps when BASE (WELD) = 100 amps & HOT START = 30 amps
INITIAL CUR.	This parameter operates in SLOPE or REPEAT (4T) TIG modes only and is used to set the start current for TIG. The Start Current remains on until the torch trigger switch is released after it has been depressed.
UP SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp up, after the torch trigger switch has been pressed then released, from INITIAL CUR to PEAK or BASE current.
PEAK CUR.	This parameter sets the PEAK weld current when in PULSE mode.
WELD	This parameter sets the TIG WELD current in STD, SLOPE, REPEAT and SPOT modes when PULSE is off. This parameter also sets the STICK weld current.
BASE (Background Current)	This parameter sets the Background current when in Pulse TIG mode.
SPOT TIME	This parameter sets the duration of the SPOT TIME in HF TIG mode only.
PULSE WIDTH	This parameter sets the percentage on time of the PULSE FREQUENCY for PEAK weld current when the PULSE is on.
PULSE FREQ.	This parameter sets the PULSE FREQUENCY when the PULSE is on.
DOWN SLOPE	This parameter operates in TIG modes only and is used to set the time for the weld current to ramp down, after the torch trigger switch has been pressed, to CRATER CUR. This control is used to eliminate the crater that can form at the completion of a weld.
CRATER CUR.	This parameter operates in SLOPE or REPEAT (4T) TIG modes only and is used to set the finish current for TIG. The CRATER Current remains on until the torch trigger switch is released after it has been depressed.

Parameter	Description
POST-FLOW	This parameter operates in TIG modes only and is used to adjust the post gas flow time once the arc has extinguished. This control is used to dramatically reduce oxidation of the tungsten electrode.
	The SAVE/LOAD buttons are used to save and retrieve a total number of 5 programs into the 300/400TS and 300/400S memory.

Table 4-3: Weld Parameter Descriptions for ARC MASTER 300/400TS

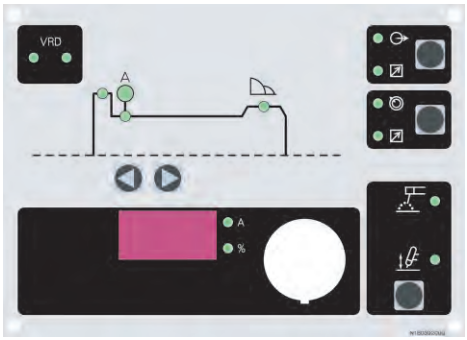


Figure 4-4:
ARCMASTER 300/400S
Front Panel with Parameter Description

Parameter	Description
HOT START	This parameter operates in STICK weld mode and is used to improve the start characteristics for stick electrodes. e.g. low hydrogen electrodes. It sets the peak start current on top of the WELD. current.
A	Weld Current (Amperage)- sets the STICK and TIG WELD current.
	ARC CONTROL - This parameter provides a suitable short circuit current in STICK welding to improve electrode sticking and arc stability.

Table 4-4: Weld Parameter Descriptions 300/400S

4 Weld Parameters for ARC MASTER 300/400TS and 300/400S

Weld Parameter		Parameter Range	Factory Setting	Incremental Unit	Weld Mode		
					STICK	HF TIG	LIFT TIG
PRE-FLOW		0.0 to 1.0 sec	0 sec	0.1 sec	No	Yes	Yes
HOT START		0 to 70A	20A	1A	Yes	Yes	No
INITIAL CUR.	300TS	5 to 300A	30A	1A	No	Yes	Yes
	400TS	5 to 400A					
UP SLOPE		0 to 15 sec	1 sec	0.1 sec	No	Yes	Yes
PEAK CUR.	300TS	5 to 300A	120A	1A	No	Yes	Yes
	400TS	5 to 400A					
WELD CUR. (TIG)	300TS	5 to 300A	80A	1A	No	Yes	Yes
	400TS	5 to 400A					
WELD CUR. (STICK)	300TS	5 to 300A	80A	1A	Yes	No	No
	400TS	5 to 400A					
SPOT TIME		0.5 to 5.0 sec	2 sec	0.1 sec	No	Yes	Yes
PULSE WIDTH		15 to 80%	50%	1%	No	Yes	Yes
PULSE FREQ.		0.5 to 500Hz	100.0Hz	See Table 4-6	No	Yes	Yes
DOWN SLOPE		0 to 25 sec	3 sec	0.1 sec	No	Yes	Yes
CRATER CUR.		5 to 40A	30A	1A	No	Yes	Yes
POST-FLOW		0.0 to 60 sec	10 sec	0.1 sec	No	Yes	Yes

Table 4-5: Weld Parameters for ARC MASTER 300/400TS

PULSE FREQ. Range	Incremental Unit
0.5 to 20Hz	0.1Hz
20 to 100Hz	1Hz
100 to 500Hz	5Hz

Table 4-6: PULSE FREQ. Range and Incremental Units

Weld Parameter		Parameter Range	Factory Setting	Incremental Unit	Weld Mode	
					STICK	LIFT TIG
HOT START		5 to 70A	20A	1A	Yes	No
WELD CUR.	300S	5 to 300A DC	80A	1A	Yes	Yes
	400S	5 to 400A DC				
ARC CONTROL		0 to 100%	10%	1%	Yes	No

Table 4-7: Weld Parameters for ARC MASTER 300/400S

5 Power Source Features

Feature	Description
New Digital Control	• Almost all welding parameters are adjustable.
Touch Panel Switches	• Touch switches eliminate mechanical damage.
Front Control Cover	• Protects front panel controls.
Digital Meter	• Displays selected weld parameter value. • Displays weld current when welding. • Displays weld current for 20 seconds after weld has been completed. • A selected weld parameter value can be adjusted at any time even while welding.
Intelligent Fan Control	• The intelligent cooling system is designed to reduce dust and foreign material build-up, whilst providing optimum cooling. • Fan speed reduces approximately 30 seconds after machine is turned on. • Fan speed increases when internal components reach operating temperature.
ON/OFF switch	• Primary voltage Supply ON/OFF switch located on rear panel.
Voltage Reduction Device (VRD)	Reduces the OCV when the power supply is not in use. Eliminates the need for add on voltage reducers and has no effect on arc starting. • VRD fully complies to IEC 60974-1 • When Stick mode is selected the green VRD light is ON when not welding and red when welding. • When in TIG modes VRD is off.
Control Knob	• For the selected weld parameter, rotating the knob clockwise increases the parameter. • Rotating the knob counter-clockwise decreases the parameter. • A selected weld parameter value can be adjusted at any time even while welding. • Pushing the knob in displays actual arc voltage.
Self Diagnosis Using Error Codes	• An error code is displayed on the Digital Meter when a problem occurs with Primary supply voltage or internal component problems. Refer to troubleshooting guide.
Save/Load function **(300/400TS only)**	• A total number of 5 programs can be saved into the 300/400TS memory. **SAVE the Current Weld Parameters into Memory.** • Press the SAVE button. • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. • After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters from the control panel are saved. **LOAD (retrieve) a Program to Control Panel.** • Press the LOAD button. • Select a memory location by rotating the control knob, 1 to 5 is displayed on the meter. After selecting the desired memory location (ie 1 to 5), press the right scroll button and the machine will give a beep to confirm the weld parameters are loaded onto the control panel.

Table 4-8: Power Source Features

5 SET-UP FOR SMAW (STICK) AND GTAW (TIG)

Conventional operating procedures apply when using the Welding Power Source, i.e. connect work lead directly to work piece and electrode lead is used to hold electrode. Wide safety margins provided by the coil design ensure that the Welding Power Source will withstand short-term overload without adverse effects. The welding current range values should be used as a guide only. Current delivered to the arc is dependent on the welding arc voltage, and as welding arc voltage varies between different classes of electrodes, welding current at any one setting would vary according to the type of electrode in use. The operator should use the welding current range values as a guide, then finally adjust the current setting to suit the application.

WARNING

Before connecting the work clamp to the work and inserting the electrode in the electrode holder make sure the Primary power supply is switched off.

CAUTION

Remove any packaging material prior to use.

Do not block the air vents at the front or rear or sides of the Welding Power Source.

CAUTION

DO NOT change the Weld Mode or Weld Process Mode until after POST-FLOW time has finished.

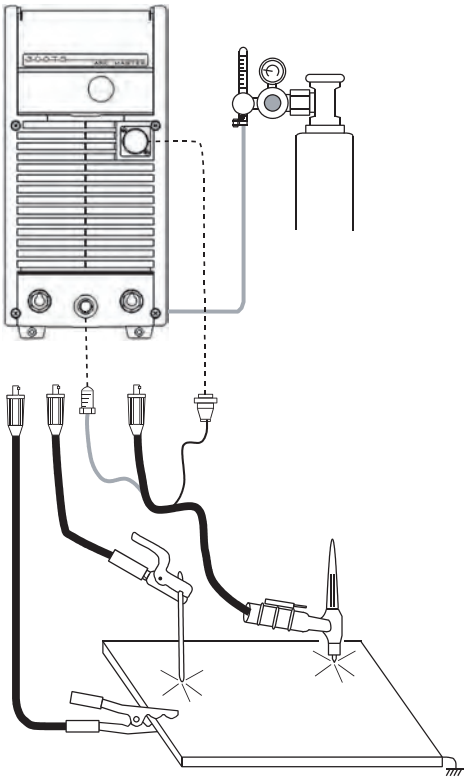


Figure 5-1: 300/400TS Set-up

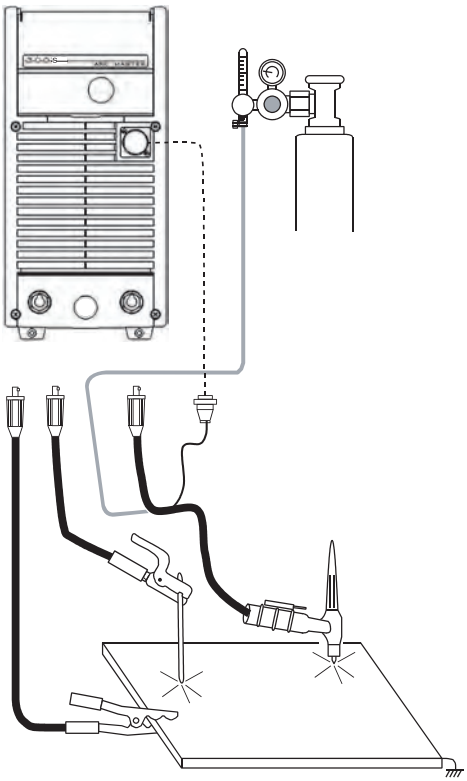


Figure 5-2: 300/400S Set-up

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6 SEQUENCE OF OPERATION

NOTE

Scroll Buttons are used to select the parameters to be set. The LED's show which function is being adjusted on the weld sequence graph. Refer to the Symbols Table located in the front of the manual for Symbol descriptions.

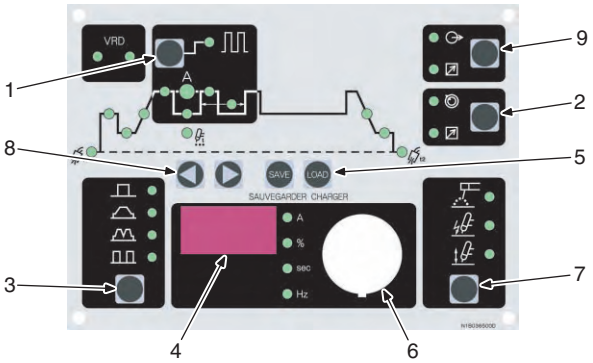


Figure 6-1: 300/40TS Front Panel

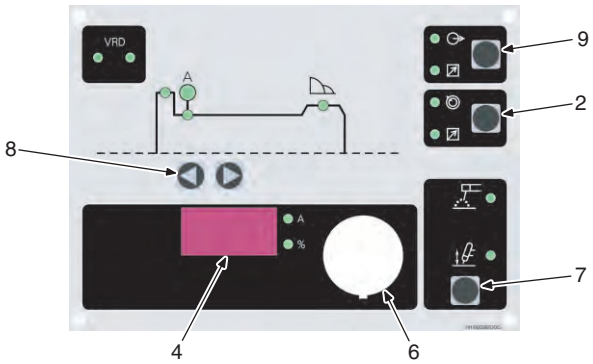


Figure 6-2: 300/400S Front Panel

1. **Pulse function:**
   Pressing this button enables the TIG current pulse functions.
2. **Remote Current function:**
   Pressing this button enables remote current functions.
3. **TIG Mode Functions:**
   Pressing this button scrolls through the output TIG function modes (Standard, Slope, Slope w/repeat, Spot).
4. **Digital LED display:**
   Welding amperage and parameter values are displayed in this window. Internal warnings such as over temperature, low or high input voltage applied are signaled to the operator by a warning sound and error message on the screen.
5. **Save/Load Buttons:**
   by using the Save & Load buttons the operator can easily save up to 5 welding parameter programs.
6. **Control knob:**
   allows the operator to adjust the output amperage within the entire range of the power source and sets each parameter value.
7. **Process Button:**
   This button selects between STICK, HF TIG and Lift TIG mode.
8. **Scroll Buttons:**
   used to select the parameters to be set. The LED's show which function is being adjusted on the Sequence Graph.
9. **Contactor function:**
   Pressing this button enables Contactor functions.

1 Stick Welding

- Connect work lead to negative terminal.
- Connect electrode lead to positive terminal.
- Switch machine on.
- Set Contactor.
- Connect remote control device if required.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph.
Use the control knob to adjust each parameter.

- Set HOT START.
- Set WELD current.

Commence welding.

2 HF TIG Welding (300/400TS only)

- Connect work lead to positive terminal.
- Connect TIG torch to negative terminal.
- Switch machine on.
- Connect remote control device if required.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph.
Use the control knob to adjust each parameter.

- Set PRE-FLOW time.
- Set HOT START current.
- Set POST-FLOW time.
- Set (WELD) PEAK CUR current.
- Set POST-FLOW time.

Slope Mode Parameters if required.

- Set INTIAL CUR current.
- Set UP SLOPE time.
- Set (WELD) PEAK CUR current.
- Set BASE current.
- Set DOWN SLOPE time.
- Set CRATER CUR current.

Pulse Mode parameters if required.

- Set PULSE WIDTH % for PEAK CURRENT.
- Set PEAK CURRENT.
- Set PULSE FREQ.

Commence welding.

3 Lift TIG Welding

- Connect work lead to positive terminal.
- Connect TIG torch to negative terminal.
- Switch machine on.
- Set weld current.
- Connect remote control device.

Use the Scroll Buttons to move to the parameter to be set. The LED will show which function is being adjusted on the weld sequence graph.
Use the control knob to adjust each parameter.

- Set WELD current

Commence welding

4 Slope Mode Sequence (300/400TS only)

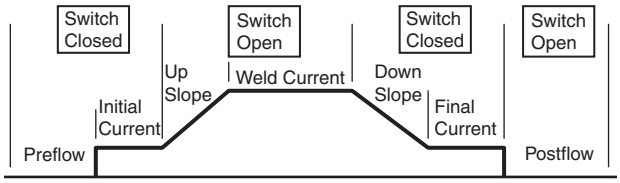


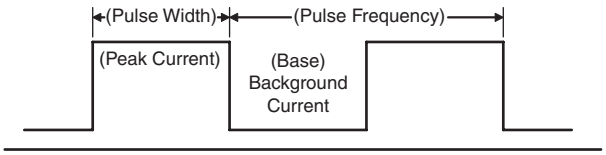
Figure 6-3: Slope Mode Sequence

1. To start Slope sequence Close remote switch contacts. Once the welding arc is established the Power Source will maintain initial current setting as long as the remote switch contacts are closed.
   a. In the HF TIG mode, after Preflow time, High Frequency is present at the torch. When the torch is positioned close to the work the welding current will transfer to the work and establish the arc at the initial current setting.
   b. In the Lift TIG mode, after Preflow time, Lift Start current is present at the torch. When the electrode is touched to the work and lifted off, the welding arc is established at the initial current setting.
2. Open Remote Switch – current increases to weld current. Once welding arc has reached weld current the power source will maintain weld current as long as the remote switch contacts are open.
3. Close Remote Switch – Welding current decreases to final current setting. Once final welding current is reached the power source will maintain final current setting as long as the remote switch contacts are closed.
4. Open Remote Switch – Welding arc stops and post flow begins.

5 Slope Mode with repeat sequence (300/400TS only)

The repeat function is operated during the down slope cycle of the Slope Sequence and is active through the down slope period only. During the down slope period by opening the Remote Switch contacts the current will increase back to weld current. Within the Down Slope period the repeat function can operated as many times as desired. To continue slope cycle and end slope sequence close remote switch contacts and allow weld current to reach final current setting. Once final current setting is reached opening the Remote Switch again will turn off the welding arc and post flow begins.

6 Pulse Controls (300/400TS only)



The Pulse controls are used primarily to control heat input. Pulse offers a number of advantages as follows:

1) Control puddle – size and fluidity (especially out of position).
2) Increase penetration.
3) Travel speed control.
4) Better consistent quality.
5) Decreased distortion on lighter or thinner materials.

Pulse-current provides a system in which the welding current continuously changes between two levels. During the periods of Peak current, heating and fusion takes place, and during the background (base) current periods, cooling and solidification take place. Pulse Width is the time in one cycle the current remains at the peak current setting. Pulse Frequency, measured in Hertz, is the number of cycles per second the current travels between peak and background current settings. It is as if the foot rheostat were moved up and down to increase and decrease the welding current on a regular basis. The faster you move the foot rheostat up and down the faster the frequency.

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7 ROUTINE MAINTENANCE

The only routine maintenance required for the power supply is a thorough cleaning and inspection, with the frequency depending on the usage and the operating environment.

WARNING

Disconnect primary power at the source before opening the enclosure. Wait at least two minutes before opening the enclosure to allow the primary capacitors to discharge.

To clean the unit, open the enclosure (please refer to Section 11.01.1, Opening the Enclosure) and use a vacuum cleaner to remove any accumulated dirt and dust. The unit should also be wiped clean, if necessary; with solvents that are recommended for cleaning electrical apparatus.

CAUTION

Do not blow air into the power supply during cleaning. Blowing air into the unit can cause metal particles to interfere with sensitive electrical components and cause damage to the unit.

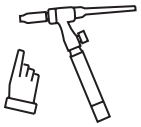
Warning!
Disconnect input power before maintaining.

Maintain more often if used under severe conditions

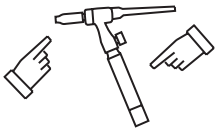
Each Use

Visual check of regulator and pressure

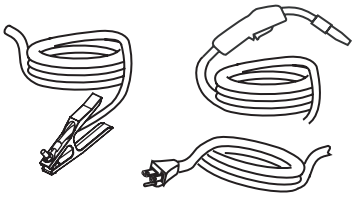
Visual check of torch Consumable parts



Weekly



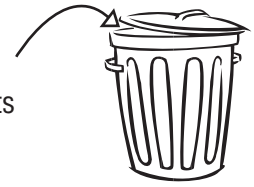
Visually inspect the torch body and consumables



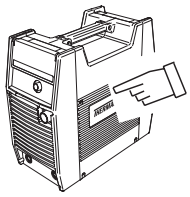
Visually inspect the cables and leads. Replace as needed

3 Months

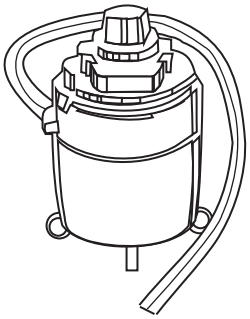
Replace all broken parts



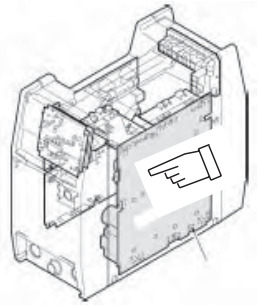
Clean exterior of power supply



6 Months



Bring the unit to an authorized Thermal Arc Service Center to remove any accumulated dirt and dust from the interior. This may need to be done more frequently under exceptionally dirty conditions.



Art # A-07331

8 BASIC TROUBLESHOOTING

WARNING

There are extremely dangerous voltages and power levels present inside this product. Do not attempt to open or repair unless you are an Accredited Thermal Arc Service Agent and you have had training in power measurements and troubleshooting techniques.

If major complex subassemblies are faulty, then the Welding Power Source must be returned to an Accredited Thermal Arc Service Agent for repair.

The basic level of troubleshooting is that which can be performed without special equipment or knowledge.

1 TIG Welding Problems

Weld quality is dependent on the selection of the correct consumables, maintenance of equipment and proper welding technique.

Description	Possible Cause	Remedy
1. Excessive bead build-up or poor penetration or poor fusion at edges of weld.	Welding current is too low.	Increase weld current and/or faulty joint preparation.
2. Weld bead too wide and flat or undercut at edges of weld or excessive burn through.	Welding current is too high.	Decrease weld current.
3. Weld bead too small or insufficient penetration or ripples in bead are widely spaced apart.	Travel speed too fast.	Reduce travel speed.
4. Weld bead too wide or excessive bead build up or excessive penetration in butt joint.	Travel speed too slow.	Increase travel speed.
5. Uneven leg length in fillet joint.	Wrong placement of filler rod.	Re-position filler rod.
6. Electrode melts when arc is struck.	A. Electrode is connected to the '+' terminal. B. WAVE BALANCE is greater than 50%.	A. Connect the electrode to the '–' terminal. B. Reduced WAVE BALANCE to below 50% or increase the electrode size.
7. Dirty weld pool.	A. Electrode contaminated through contact with work piece or filler rod material. B. Gas contaminated with air.	A. Clean the electrode by grinding off the contaminates. B. Check gas lines for cuts and loose fitting or change gas cylinder.
8. Electrode melts or oxidizes when an arc is struck.	A. No gas flowing to welding region. B. Torch is clogged with dust. C. Gas hose is cut. D. Gas passage contains impurities. E. Gas regulator turned off. F. Torch valve is turned off. G. The electrode is too small for the welding current. H. WAVE BALANCE is set above 50%.	A. Check the gas lines for kinks or breaks and gas cylinder contents. B. Clean torch. C. Replace gas hose. D. Disconnect gas hose from torch then raise gas pressure and blow out impurities. E. Turn on. F. Turn on. G. Increase electrode diameter or reduce the welding current. H. Reduced WAVE BALANCE to below 50% or increase the electrode size.

Description	Possible Cause	Remedy
9. Poor weld finish.	Inadequate shielding gas.	Increase gas flow or check gas line for gas flow problems.
10. Arc flutters during TIG welding.	A. Tungsten electrode is too large for the welding current. B. Absence of oxides in the weld pool.	A. Select the right size electrode. Refer to Basic TIG Welding guide. B. Refer Basic TIG Welding Guide for ways to reduce arc flutter.
11. Welding arc can not be established.	A. Work clamp is not connected to the work piece or the work/torch leads are not connected to the right welding terminals. B. Torch lead is disconnecte. C. Gas flow incorrectly set, cylinder empty or the torch valve is off.	A. Connect the work clamp to the work piece or connect the work/torch leads to the right welding terminals. B. Connect it to the '–' terminal. C. Select the right flow rate, change cylinders or turn torch valve on.
12. Arc start is not smooth.	A. Tungsten electrode is too large for the welding current. B. The wrong electrode is being used for the welding job. C. Gas flow rate is too high. D. Incorrect shielding gas is being used. E. Poor work clamp connection to work piece.	A. Select the right size electrode. Refer to Basic TIG Welding Guide. B. Select the right electrode type. Refer to Basic TIG Welding Guide. C. Select the correct rate for the welding job. Refer to Basic TIG Welding Guide. D. Select the right shielding gas. Refer to Basic TIG Welding Guide. E. Improve connection to work piece.

Table 8-1: TIG Welding Problems

2 Stick Welding Problems

Description	Possible Cause	Remedy
1. Gas pockets or voids in weld metal (Porosity).	A. Electrodes are damp.	A. Dry electrodes before use.
	B. Welding current is too high.	B. Reduce welding current.
	C. Surface impurities such as oil, grease, paint, etc.	C. Clean joint before welding.
2. Crack occurring in weld metal soon after solidification commences.	A. Rigidity of joint.	A. Redesign to relieve weld joint of severe stresses or use crack resistance electrodes.
	B. Insufficient throat thickness.	B. Travel slightly slower to allow greater build up in throat.
	C. Cooling rate is too high.	C. Preheat plate and cool slowly.
3. A gap is left by failure of the weld metal to fill the root of the weld.	A. Welding current is too low.	A. Increase welding current.
	B. Electrode too large for joint.	B. Use smaller diameter electrode.
	C. Insufficient gap.	C. Allow wider gap.
	D. Incorrect sequence.	D. Use correct build-up sequence.

Table 8-2-a: STICK Welding Problems

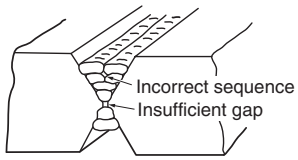


Figure 8-1: Example of insufficient gap or incorrect sequence

Description	Possible Cause	Remedy
4. Portions of the weld run do not fuse to the surface of the metal or edge of the joint.	A. Small electrodes used on heavy cold plate.	A. Use larger electrodes and preheat the plate.
	B. Welding current is too low.	B. Increase welding current.
	C. Wrong electrode angle.	C. Adjust angle so the welding arc is directed more into the base metal.
	D. Travel speed of electrode is too high.	D. Reduce travel speed of electrode.
	E. Scale or dirt on joint surface.	E. Clean surface before welding.

Table 8-2-b: STICK Welding Problems (continued)

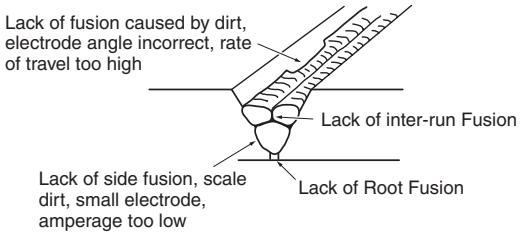

Lack of fusion caused by dirt, electrode angle incorrect, rate of travel too high
Lack of inter-run Fusion
Lack of side fusion, scale dirt, small electrode, amperage too low
Lack of Root Fusion

Figure 8-2: Example of lack of fusion

Description	Possible Cause	Remedy
5. Non-metallic particles are trapped in the weld metal (slag inclusion).	A. Non-metallic particles may be trapped in undercut from previous run.	A. If bad undercut is present, clean slag out and cover with a run from a smaller diameter electrode.
	B. Joint preparation too restricted.	B. Allow for adequate penetration and room for cleaning out the slag.
	C. Irregular deposits allow slag to be trapped.	C. If very bad, chip or grind out irregularities.
	D. Lack of penetration with slag trapped beneath weld bead.	D. Use smaller electrode with sufficient current to give adequate penetration. Use suitable tools to remove all slag from corners.
	E. Rust or mill scale is preventing full fusion.	E. Clean joint before welding.
	F. Wrong electrode for position in which welding is done.	F. Use electrodes designed for position in which welding is done, otherwise proper control of slag is difficult.

Table 8-2-c: STICK Welding Problems (continued)

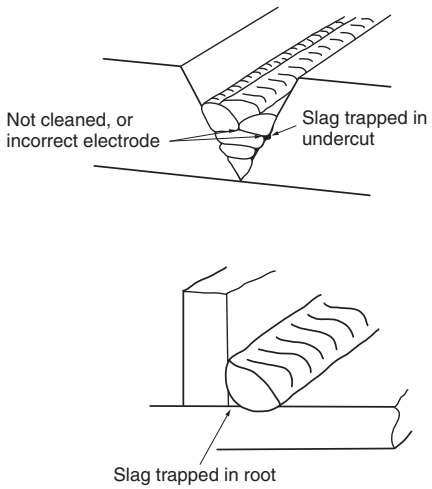


Figure 8-3: Examples of slag inclusion

3 Power Source Problems

Description	Possible Cause	Remedy
1. The welding arc cannot be established.	A. The Primary supply voltage has not been switched ON.	A. Switch ON the Primary supply voltage.
	B. The Welding Power Source switch is switched OFF.	B. Switch ON the Welding Power Source.
	C. Loose connections internally.	C. Have an Accredited Thermal Arc Service Agent repair the connection.
2. Maximum output welding current can not be achieved with nominal Mains supply voltage.	Defective control circuit.	Have an Accredited Thermal Arc Service Agent repair the connection.
3. Welding current reduces when welding.	A. Loose welding cable connections.	A. Tighten all welding cable connections.
	B. Incorrect welding cable size.	B. Use proper size and type of cable.
	C. Improper input connections.	C. Refer to Section 2.05 Electrical Input Requirements.
	D. Poor electrode condition.	D. Replace electrode.
	E. Wrong welding polarity.	E. Verify output torch connections.
4. No gas flow when the torch trigger switch is depressed.	A. Gas hose is cut.	A. Replace gas hose.
	B. Gas passage contains impurities.	B. Disconnect gas hose from the rear of Power Source then raise gas pressure and blow out impurities.
	C. Gas regulator turned off.	C. Turn gas regulator on.
	D. Torch trigger switch lead is disconnected or switch/cable is faulty.	D. Reconnect lead or repair faulty switch/cable.
5. Gas flow won't shut off.	A. Weld Mode (STD, SLOPE, REPEAT or SPOT) was changed before POST-FLOW gas time had finished.	A. Strike an arc to complete the weld cycle. OR Switch machine off then on to reset solenoid valve sequence.
	B. Gas valve is faulty.	B. Have an Accredited Thermal Arc Service Agent repair or replace the gas valve.
	C. Gas valve jammed open.	C. Have an Accredited Thermal Arc Service Agent repair or replace the gas valve.
	D. POST-FLOW control is set to 60 sec.	D. Reduce POST-FLOW time.
6. The TIG electrode has been contaminated due to the gas flow shutting off before the programmed POST-FLOW time has elapsed.	The Weld Process Mode (STICK, HF TIG or LIFT TIG) was changed before POST-FLOW gas time had finished.	Do not change Weld Process Mode before the POST-FLOW gas time had finished.

Table 8-3: Power Source Problems

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9 VOLTAGE REDUCTION DEVICE (VRD)

1 VRD Specification

Description	ARC MASTER 300/400TS, 300/400S	Notes
VRD Open Circuit Voltage	15.3 to 19.8V	Open circuit voltage between welding terminals.
VRD Resistance	148 to 193 ohms	The required resistance between welding terminals to turn ON the welding power.
VRD Turn OFF Time	0.2 to 0.3 seconds	The time taken to turn OFF the welding power once the welding current has stopped.

Table 9-1: VRD Specification

2 VRD Maintenance

Routine inspection and testing (power source):

An inspection of the power source should be carried out.

a. For transportable equipment, at least once every 3 months; and

b. For fixed equipment, at least once every 12 months.

The owners of the equipment shall keep a suitable record of the periodic tests.

NOTE

A transportable power source is any equipment that is not permanently connected and fixed in the position in which it is operated.

In addition to the above tests and specifically in relation to the VRD fitted to this machine, the following periodic tests should also be conducted by an accredited Thermal Arc service agent.

Description	IEC 60974-1 Requirements
VRD Open Circuit Voltage	Less than 20V; at Vin= 400V
VRD Turn ON Resistance	Less than 200 ohms
VRD Turn OFF Time	Less than 0.3 seconds

Table 9-2: Periodic Tests

If this equipment is used in a location or an environment with a high risk of electrocution then the above tests should be carried out prior to entering this location.

The test of VRD is shown below:

1) In STICK welding mode, mark and then turn potentiometer VR1 on PCB6 (WK-5549) all the way to the left and turn on the electric shock protector function (Voltage-Reduction-Device, VRD).
2) Contactor function is put into the state of "ON" pushing Function button. Refer to section 6.
3) Verify the no-load voltage (OCV) using a DC voltmeter. (The capability of the voltmeter should be more than 100VDC.)
4) The normal no-load voltage is approximately 18V.
5) In STICK welding mode, mark and then turn potentiometer VR1 on PCB6 (WK-5549) all the way to the right and turn off the VRD.
6) Contactor function is put into the state of "ON" pushing Function button. Refer to section 6.

WARNING

Electric shock hazard. The unit will generate OCV (Open Circuit Voltage) immediately when contactor function is put into the state of on pushing Function button enabling STICK mode.

7) Verify the no-load voltage (OCV) using a DC voltmeter. (The capability of the voltmeter should be more than 100VDC.)
8) The normal no-load voltage is approximately 65V.

3 Switching VRD On/Off

Switch the machine Off.

A) Remove the clear plastic cover from the control panel (see Figure 9-1).
- Lift up the cover so it rests on the top of the unit.
- Place a small flat bladed screw driver between the cover hinge on the front panel.
- Gently lift the cover hinge out of the front cover mounting hole.
- Remove the control's clear plastic cover.

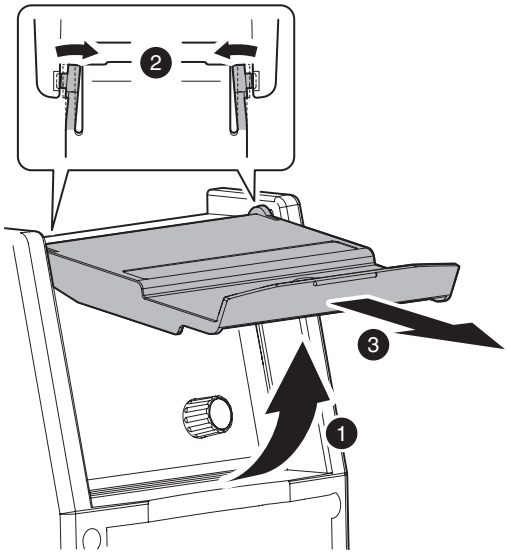


Figure 9-1: VRD ON/OFF Step A

B) Remove four mounting screws from the control panel (see Figure 9-2).

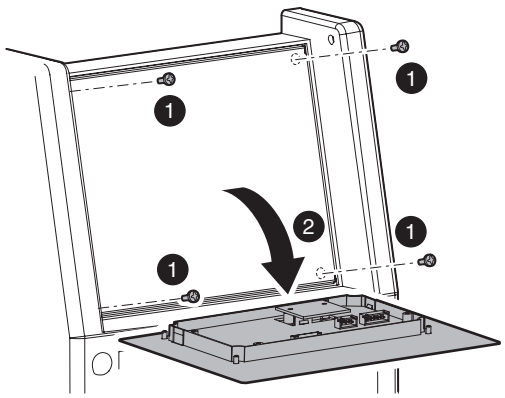


Figure 9-2: VRD ON/OFF Step B,C

C) Access the VRD control by gently prying back the front panel controls to reveal the VRD on/off potentiometer (see Figure 9-3).

CAUTION

Do not pull back the front panel with excessive force as this will unplug control PCB. Plugging the control PCB back into the front panel controls can only be achieved by removing the side covers.

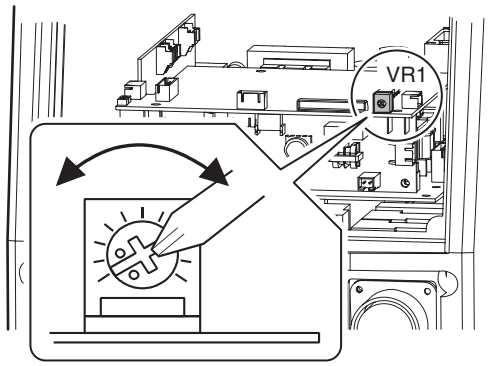


Figure 9-3: VRD ON/OFF Step D

D) Turning the VRD ON/OFF (see Figure 9-3).
- To turn VRD ON: rotate the trim potentiometer (VR1) on the display PCB fully clockwise. When VRD is turned ON check that it operates as per VRD Specifications on section 9.1.
- To turn VRD OFF: rotate the trim potentiometer (VR1) on the display PCB fully counter clockwise.

WARNING

The VRD ON/OFF trim potentiometer MUST ONLY be positioned fully clockwise OR fully counter clockwise as the VRD function will be unknown for every other position.

10 POWER SOURCE ERROR CODE

Description	Possible Cause	Remedy	Remarks
1. E01 error code displayed Temperature sensor TH1 (protects IGBTs) is greater than 80°C for about 1 second.	A. The Welding Power Source's duty cycle has been exceeded. B. Fan ceases to operate. C. Air flow is restricted by vents being blocked.	A. Let Power Source cool down then keep within its duty cycle. B. Have an Accredited Thermal Arc Service Agent investigate. C. Unblock vents then let Power Source cool down.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E01 resets when TH1 decreases to 70°C for about 30 seconds.
2. E02 error code displayed Temperature sensor TH2 (protects secondary diodes) is greater than 80°C for about 1 second.	A. The Welding Power Source's duty cycle has been exceeded. B. Fan ceases to operate. C. Air flow is restricted by vents being blocked.	A. Let Power Source cool down then keep within its duty cycle. B. Have an Accredited Thermal Arc Service Agent investigate C. Unblock vents then let Power Source cool down.	Weld current ceases. Buzzer sounds constantly. Fan operates at max speed. E02 resets when TH2 decreases to 70°C for about 30 seconds.
3. E03 error code displayed Transformer current too high.	A. Transformer current is too high because welding arc is too long. B. Mains supply voltage is more than 10% below nominal voltage .	A. Reduce length of welding arc. B. Have an Accredited Thermal Arc Service Agent or a qualified electrician check for low Mains voltage.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E03 error.
4. E04 error code displayed Output voltage exceeds the secondary voltage specification.	TIG torch cable and/or work lead are too long or leads are coiled.	Reduce the length of the TIG torch cable and/or work lead or un-coiled leads.	Weld current ceases. Buzzer sounds constantly. Switch machine off then on to reset E04 error.
5. E11 error code displayed Over Primary supply (input) voltage at primary capacitors is exceeded for one second.	Primary supply voltage is greater than the nominal voltage plus 10%.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Primary voltage.	Weld current ceases. Buzzer sounds constantly. Error code E11 automatically will reset when the voltage reduces.
6. E14 error code displayed Under mains supply (input) voltage warning primary capacitors is reduced for one second.	Mains supply voltage is less than the nominal operating voltage less 10%.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage.	Weld current available. Buzzer sounds intermittently./Error code E14 automatically will reset when the voltage increases.
7. E12 error code displayed Under mains supply (input) voltage primary capacitors is reduced for one second.	Mains supply voltage is down to a dangerously low level.	A. Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage. B. Have an Accredited Thermal Arc Service Agent or a qualified electrician check the primary cable and fuses.	Weld current ceases. Buzzer sounds constantly. Error code E12 automatically will reset when the voltage increases.
8. E81 error code displayed Wrong Primary supply (input) voltage connected.	When 3 phase machine is first turned on with the wrong Primary supply (input) voltage connected.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off.

Description	Possible Cause	Remedy	Remarks
9. E82 error code displayed Rated voltage selection circuit abnormality.	The Primary supply (input) voltage fluctuates and is not stable.	Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off then on to reset E82 error.
10. E83 error code displayed CPU checks mains supply (input) voltage when the on/off switch on rear panel of machine is turned ON.	The Primary supply (input) voltage fluctuates and is not stable.	Have an Accredited Thermal Arc Service Agent check connector plug on input PCB and the Mains voltage.	No weld current is available. Buzzer sounds constantly. Switch machine off then on to reset E83 error.
11. E85 error code displayed Pre-charge abnormality.	Due to malfunction inside the Welding Power Source, primary capacitors are not charging correctly.	Have an Accredited Thermal Arc Service Agent service the machine.	No weld current is available. Buzzer sounds constantly. Switch machine off then on to reset E85 error.
12. E93 error code displayed Memory chip (EEPROM) on control PCB can not read/write weld parameters.	Memory chip (EEPROM) error.	Have an Accredited Thermal Arc Service Agent check the control PCB.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
13. E94 error code displayed Temperature sensor TH1 for IGBTs or sensor TH2 for secondary diodes are open circuit.	The Welding Power Source's temperature sensors have malfunctioned.	Have an Accredited Thermal Arc Service Agent check or replace the temperature sensors.	Weld current ceases. Buzzer sounds constantly. Switch machine off.
14. E99 error code displayed Mains supply (input) voltage has been turned off but control circuit has power from the primary capacitors.	A. Main on/off switch on machine has been turned off B. Mains supply (input) voltage has been turned off.	A. Turn on/off switch on. B. Have an Accredited Thermal Arc Service Agent or a qualified electrician check the Mains voltage and fuses.	Weld current ceases. Buzzer sounds constantly. Must switch machine off then on to reset E99 error.

Table 10-1: Power Source Error Codes

11 ADVANCED TROUBLESHOOTING

If you are here, all of the troubleshooting suggestions in Section 8-Basic Troubleshooting have either failed to resolve the faulty operation or have indicated that one or more of the subsystems within the power supply are defective. This section provides the information needed to take live measurements on the various subsystems within the power supply, and replace those subsystems that prove faulty.

CAUTION

Troubleshooting and repairing this unit is a process, which should be undertaken only by those familiar with high voltage/high power electronic equipment.

WARNING

There are extremely dangerous voltage and power levels present inside this unit. Do not attempt to diagnose or repair unless you have training in power electronics, measurement and troubleshooting techniques.

Under no circumstances are field repairs to be attempted on printed circuit boards or other subassemblies of this unit. Evidence of unauthorized repairs will void the factory warranty. If a subassembly is found to be defective by executing any of the procedures in this Service Manual, the subassembly should be replaced with a new one. The faulty subassembly should then be returned to Thermal Arc through established procedures.

WARNING

Disconnect primary power at the source before disassembling the power supply. Frequently review the "Important Safety Precautions" in section 1.02. Be sure the operator is equipped with proper gloves, clothing and eye and ear protection. Make sure no part of the operator's body comes into contact with the work piece or any internal components while the unit is activated.

1 System-Level Fault Isolation

If none of the suggestions provided in Section 8 have solved the problem or corrected the faulty operation, the next step is to isolate one or more of the internal subassemblies that may be defective.

CAUTION

Perform all steps in each procedure, in sequence. Skipping portions of procedures, or performing steps out of sequence can result in damage to the unit, and possible injury, or worse, to the operator.

1.1 Opening the Enclosure

1) Confirm that the switch of power supply and the switch on switchboard (distribution panel) are all OFF.

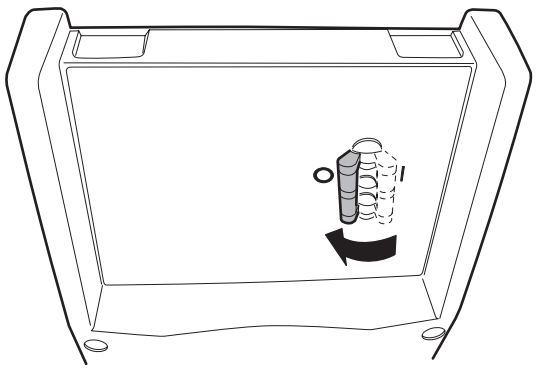


Figure 11-1: Switch OFF

CAUTION

The capacitors inside the power supply will slowly discharged after you turn off the switch of the power supply or the switch at the breaker box (distribution panel). Wait at least 5 minutes for the discharge to complete.

2) Remove all screws and nuts on the side covers.

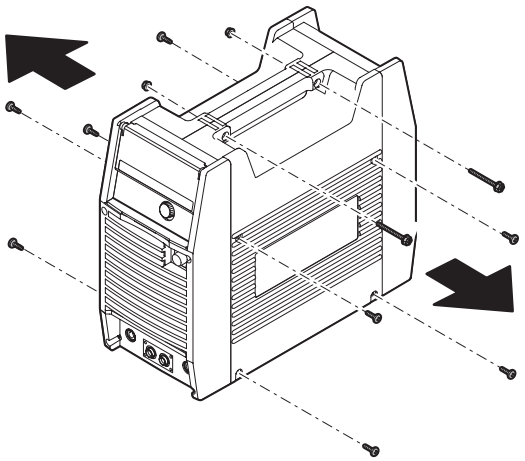


Figure 11-2: Remove screws

3) Loosen the screws on the front panel and the rear panel by turning them approximately two turns CCW.

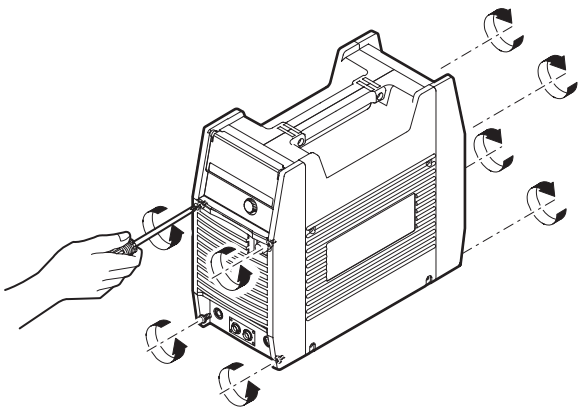


Figure 11-3: Loosen screws

NOTE

DO NOT remove the screws completely.

4) Pull the front panel slightly forward and pull the rear panel slightly backward. The interlocking hooks of the side case covers can now be disengaged from the front and rear panels.

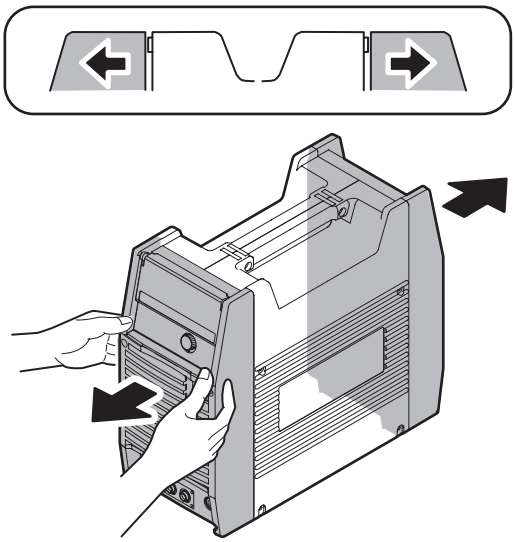


Figure 11-4: Loosen front and rear panels

5) Remove the side covers.

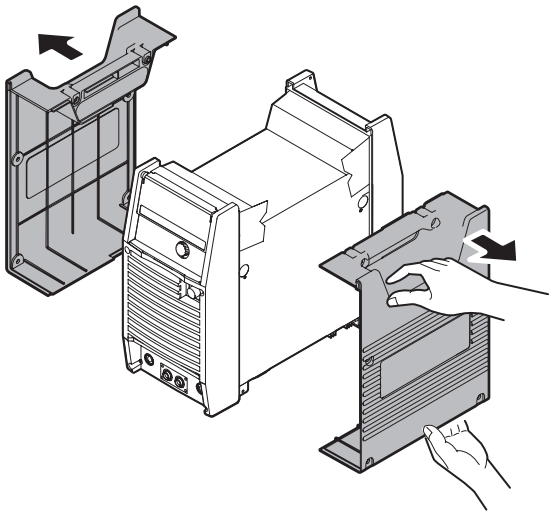


Figure 11-5: Remove Side covers

6) Remove protection cover sheet by removing the plastic tabs.

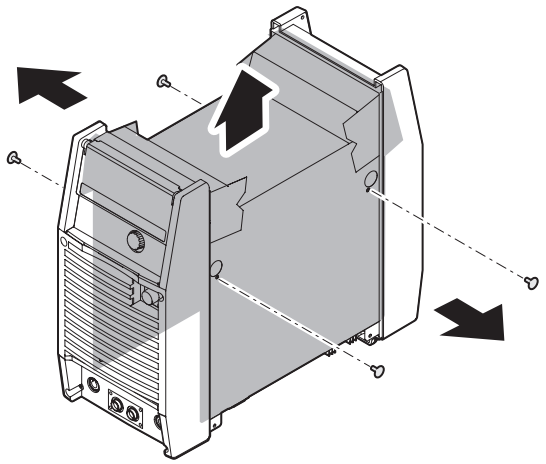


Figure 11-6: Remove PCB cover

NOTE

When you re-assemble the parts, conduct the above process backwards.

2 Verification and Remedy to the Indicated Error Codes

NOTE

The capacitors inside the power supply will slowly discharged after you turn off the switch of the power supply or the switch at the breaker box (distribution panel). Wait at least 5 minutes for the discharge to complete and then remove the cases to continue your inspection and repair (or maintenance) inside the power supply. As for the removal and installation of the case, refer to section 11.1.1.

NOTE

*During the "**Verification/Remedy**" procedures below, follow the alphabetical sequence (a, b, c...) and proceed with your verification and confirmation.*

NOTE

After you confirm and replace all spare parts and components, confirm that there are no damaged harnesses or connectors, uninstalled or loose screws.

2.1 E01 "Over-Temperature at the primary side"

Cause

Occurs when an over-temperature condition of the primary IGBT is detected.

Verification/Remedy

a) Unit may be in thermal shutdown mode.
- Review the rated duty cycle of the unit per section 3.8. Exceeding the duty cycle can damage the unit and void the warranty. Refer also to section 1.6 for additional information.

b) Verify the ventilating condition.
- Maintain a clear and unobstructed distance of more than 30cm in the front and more that 50cm in the rear of the unit for ventilation purposes.
- Verify and maintain clean, dust free, front and rear airflow paths. Cleaning and removing dust from the front and rear panels once every six months in a normal working environment is recommended. Extremely dusty environments will require more frequent cleanings.

c) Verify the operation of the cooling fan, FAN1, and replace it if necessary.
- Verify the condition of FAN1. Verify that there are no broken or cracked fan blades and that FAN1 is not producing any abnormal sounds.
- If broken or cracked FAN1 blades, or abnormal sounds are emanating from FAN1, replace FAN1.
- Verify the operation of the cooling fan and replace it if the condition of FAN1 is inactive. Follow the instruction in section.
- Refer to section 12.3.21 for the replacement of FAN1.
- Refer to section 11.5.3 for additional FAN1 tests.

d) Replace PCB6 (WK-5549).
- Refer to section 12.3.6 for the replacement of PCB6.

2.2 E02 "Over-Temperature at the secondary side"

Cause

Occurs when an over-temperature condition of the secondary IGBT and diode are detected.

Verification/Remedy

a) Unit may be in thermal shutdown mode.
- Review the rated duty cycle of the unit per section 3.8. Exceeding the duty cycle can damage the unit and void the warranty.

b) Verify the ventilating condition.
- Maintain a clear and unobstructed distance of more than 30cm in the front and more that 50cm in the rear of the unit for ventilation purposes.
- Verify and maintain clean, dust free, front and rear airflow paths. Cleaning and removing dust from the front and rear panels once every six months in a normal working environment is recommended. Extremely dusty environments will require more frequent cleanings.

c) Verify the operation of the cooling fan, FAN1, and replace it if necessary.
- Verify the condition of FAN1. Verify that there are no broken or cracked fan blades and that FAN1 is not producing any abnormal sounds.
- If broken or cracked FAN1 blades, or abnormal sounds are emanating from FAN1, replace FAN1.
- Verify the operation of the cooling fan and replace it if the condition of FAN1 is inactive. Follow the instruction in section.
- Refer to section 12.3.21 for the replacement of FAN1.
- Refer to section 11.5.3 for addition FAN1 tests.

d) Replace PCB6 (WK-5549).
- Refer to section 12.3.6 for the replacement of PCB6.

2.3 E03 "Transformer Over-Current Failure"

Cause

Occurs when excessive current is detected flowing into the primary side of the main transformer.

Verification/Remedy

a) Confirm the operation of the machine within the rated specification.
- Refer to the specification data sheet in Section 3.9.

b) Verify the secondary diode (D2, D4, D5 and D7).
- Refer to section 11.5.6 for the test and replacement of D2, D4, D5 and D7.

c) Replace the Hall CT, HCT1.
- Refer to section 12.3.29 for the replacement of HF.UNIT 1.

NOTE

Pay special attention to installed direction of HCT1. The Hall CT will not function properly if installed in the incorrect direction.

- Refer to section 12.3.27 for the replacement of HCT1.

d) Verify the H.F. unit (HF. UNIT1).
- Refer to section 12.3.26 for the replacement of HF.UNIT 1.

(300/400TS only)

2.4 E04 "Torch Cable Failure"

Cause

The combined length of the torch cable and the work cable is too long.

Verification/Remedy

a) Verify the rated duty cycle of the torch/work cable and the power supply.
- Only use appropriate sized torch cables (length and capacity). The recommended total combined length of the torch and work cable is 50 feet.
- Torch and work cable should not be "coiled" during welding operations.
- Maintain the duty cycle of the power supply. Refer to section 3.8 for the recommended duty cycle.

b) Replace PCB6 (WK-5549)
- Refer to section 12.3.6 for the replacement of PCB6.

2.5 E11 "Main Supply Over Voltage"

Cause

Main supply voltage occurs in about 275V or more.

Verification/Remedy

a) Verify main supply voltage.
- Perform what is described in a section of "Verification of the Power Supply Voltage". Refer section 11.5.2.

b) Replace PCB4 (WK-4819)
- Verify PCB4 (WK-4819) and replace it if necessary. Refer to section 12.3.4.

2.6 E12 "Main Supply Under Voltage"

Cause

Main supply voltage occurs at about 150V or less.

Verification/Remedy

a) Verify main supply voltage.
- Perform what is described in a section of "Verification of the Power Supply Voltage". Refer to section 11.5.2

b) Replace PCB4 (WK-4819)
- Replace PCB4, when abnormalities occur, even if carries out the above-mentioned verifications. Refer to section 12.3.4.

2.7 E81 "Wrong Main Supply Voltage"

Cause

The detection circuitry of main supply voltage is abnormality.

Verification/Remedy

a) Verify main supply voltage.
- Perform what is described in a section of "Verification of the Power Supply Voltage". Refer to section 11.5.2.

b) Confirm a secure connection of the harness wired between CN2 on PCB3 (WK-5548) and CN1 on PCB21 (WK-4917)
- Re-install the harness with a secure connection.
- Contact the manufacturer if you find any broken connectors or damaged wiring harness.
- When the PCB fixed screw is loosening, it fastens certainly.

c) Verify PCB4 (WK-4819) and replace it if necessary
- Check whether there are any abnormalities on the appearance of PCB4.
- Replace PCB4. Refer to section 12.3.4.

2.8 E82 "Rated Voltage Selection Circuit abnormality"

Cause

Rated voltage selection circuit inside the Welding Power Source is not functioning properly.

Verification/Remedy

a) Verify the wiring harness and connection of CN4 on PCB4 (WK-4819).
- Re-install the harness with a secure connection.
- Contact the manufacturer if you find any broken connectors or damaged wiring harness.
- When the PCB fixed screw is loosening, it fastens certainly.

b) Verify PCB4 (WK-4819) and replace it if necessary.
- Check whether there are any abnormalities on the appearance of PCB4.
- Replace PCB4. Refer to section 12.3.4.

2.9 E83 "Abnormalities in Mains Supply Voltage Detection"

Cause

Abnormalities, such as an input voltage detection circuit.

Verification/Remedy

a) Verify main supply voltage.
- Perform what is described in a section of "Verification of the Power Supply Voltage". Refer to section 11.5.2.

b) Confirm a secure connection of the harness wired between CN2 on PCB3 (WK-5548) and CN1 on PCB21 (WK-4917).
- Re-install the harness with a secure connection.
- Contact the manufacturer if you find any broken connectors or damaged wiring harness.
-

c) Verify PCB4 (WK-4819) and replace it if necessary.
- Check whether there are any abnormalities on the appearance of PCB4.
- Replace PCB4. Refer to section 12.3.4.

2.10 E85 "Pre-charge abnormality"

Cause

Due to a malfunction inside the Welding Power Source, primary capacitors are not charging correctly.

Verification/Remedy

a) Verify the connection PCB2 (WK-5597) and the rectified output voltage of the rectifier.
- Verify the connection between CN2 on PCB2 and CN3 on PCB3.
- Confirm whether there is any breakage (blown, burnt, cracked, etc.) of R18 on PCB2.
- Perform what is described in a section of "Verification of the Power Supply Voltage". Refer to section 11.5.2.

b) Verify the primary diode (D1).
- Verify D1. Refer to section 11.5.5.
- Replace D1. Refer to section 12.3.28.

c) Verify the primary IGBT (Q1-Q24).
- Verify IGBT. Refer to section 11.5.7.
- Replace IGBT. Refer to section 12.3.7, 12.3.8.

d) Replace PCB2 (WK-5597) and PCB4 (WK-4819).
- Replace PCB2 and PCB4, when abnormalities occur, even if you carry out the above-mentioned verifications. Refer to section 12.3.2, 12.3.4.

2.11 E94 "Thermistor malfunction"

Cause

Thermistors for detecting temperature of internal components have malfunctioned.

Verification/Remedy

a) Confirm a secure connection of the harness wired between CN8-9 on PCB6 (WK-5549) and Thermistors (TH1, TH2).
   - Re-install the harness with a secure connection.
   - Contact the manufacturer if you find any broken connectors or damaged wiring harness.

b) Replace thermistors (TH1, TH2).
   - Refer to section 12.3.19, 12.3.20.

c) Replace PCB6 (WK-5549).
   - Refer to section 12.3.6.

2.12 E99 "Initial Power Receiving"

Cause

Occurs when the initial AC power received signal has not reached the CPU. This error occurs normally during the power "OFF" sequence of the unit.

Verification/Remedy

a) Confirm a secure connection of the harness wired between CN1 on PCB21 (WK-4917) and CN2 on PCB3 (WK-5548).
   - Re-install the harness with a secure connection.
   - Contact the manufacturer if you find any broken connectors or damaged wiring harness.

b) Verify PCB4 (WK-4819) and replace it if necessary.
   - Confirm a secure connection of all the harnesses wired to PCB3 and PCB4.
   - Replace PCB4. Refer to section 12.3.4.

c) Replace PCB6 (WK-5549).
   - Refer to section 12.3.6.

3 Verification and Remedy to Failures without Indication Codes

3.1 "Cooling Fan (FAN1) Failure" (Fan is not rotating.)

Cause

Occurs when the cooling fan (FAN1) is defective, damaged or the driving voltage is incorrect.

Verification/Remedy

a) Verify the cooling fan (FAN1).
   - Inspect the condition of the fan blades and all peripheral parts. Clean the fan blades and all peripheral parts if covered with dust. Cleaning and removing dust from the fan blades once every 6 months in a normal environment is recommended. Extremely dusty environments will require more frequent cleanings.
   - Verify that there are no wiring harnesses entangled inside the fan, confirm that the harnesses do not have any brakes in the wire or damaged connectors.
   - Replace wiring harnesses if you find any broken connectors or damaged wiring harnesses.
   - Replace the fan if there are any broken, cracked or missing fan blades.
   - Refer to section 12.3.21.

b) Verify the wiring harness between the cooling fan (FAN1) and CN11 on PCB3 (WK-5548).
   - Confirm a secure connection of the harness to CN11 on PCB3.

c) Verify the drive circuitry of the cooling fan (FAN1) on PCB3.
   - Verify the drive circuitry of the cooling fan (FAN1) on PCB3.
   - Refer to section 11.5.3.
   - Replace PCB3 if necessary.
   - Refer to section 12.3.3.

3.2 "Gas Valve Failure" (No Gas flow through unit) (300/400TS only)

Cause

Occurs when the gas valve (SOL1) is defective, damaged or the driving voltage is incorrect.

Verification/Remedy

a) Confirm that TIG welding is selected on the welding mode.
   - Do not change welding modes while welding. Only change welding modes when the unit is idle (torch switch OFF).
   - Verify the setting of Pre-flow and Post-flow on the front panel. If the Pre-flow or Post-flow time is set to 0 seconds, change them to higher setting.

b) Verify the layout the of the gas hose.
   - Confirm that the hose is securely connected into the fitting at the inlet and the outlet. Confirm the layout of the gas hose so that it is not bent or kinked. Confirm there are no breaks, burns or holes in the hose.
   - Confirm the layout of the TIG torch gas hose and that the hose adapters are properly connected.

c) Verify the wiring harness and connection of gas valve (SOL1) and CN11 on PCB3 (WK-5548).

d) Verify the drive circuitry of the gas valve (SOL1).
   - Verify the drive circuitry of the gas valve (SOL1).
   - Refer to section 11.5.4.
   - Replace PCB3, when abnormal.
   - Refer to section 12.3.3.

e) Replace the PCB6 (WK-5549).
   - Refer to section 12.3.6.

3.3 "No Weld Output"

When in High Frequency TIG (HF TIG) mode, if the High Frequency is not generated (present), refer to "High Frequency Output Failure". Refer to the page 11-9.

Cause

Occurs when the remote connector (CON1) or associated circuitry is defective, damaged, or the TIG torch cable is defective.

Verification/Remedy

Caution

Read and understand this entire section before proceeding. Extreme personal harm and test equipment damage will occur if the procedures are not performed accurately.

a) Verify the remote connector (CON1). (Applies to LIFT TIG and High Frequency TIG (HF TIG) mode.)
   - Confirm a secure between the remote connector (CON1) and the TIG torch cable.
   - Confirm a secure connection of the harness and the connections between the remote connector (CON1) and PCB7 (WK-5550) are all correct and there are no open circuits.
   - Contact the manufacture if you find any broken connectors or damaged wiring harnesses.
   - Confirm the proper pin-outs of the remote connector at the TIG Torch side. (Refer to the Operating Manual.)
   - Confirm that there is no open circuit on the remote connector at TIG Torch side.
   - In equipment for remote control use, confirm the pin specification of a connector. (Refer to the Operating Manual.)

b) Verify the condition and connections of the welding cable, the stick rod holders and the ground clamp. (Applies to all welding modes.)
   - Confirm a secure connection of the welding cable, stick rod holders, ground clamp and dense connectors and there are no open circuits.

c) Verify the no-load voltage (OCV).
(Applies to STICK, High Frequency TIG (HF TIG) mode.)
- Refer to the section "Verification of No-load voltage (OCV)" in section 11.5.9.
- If performing the "No-Load Voltage Failure" procedure does not rectify the failure, perform the following tests in the sequence below. Replace any defective components found.

1. Secondary diode (D2, D4, D5 and D7).
   - Verification. Refer to section 11.5.6.
   - Replacement. Refer to section 12.3.29.
2. Coupling coil (CC1) **(300/400TS only)**
   - Replacement. Refer to section 12.3.17.
3. Reactor (FCH1)
   - Replacement. Refer to section 12.3.18.
4. PCB14 (T1)
   - Replacement. Refer to section 12.3.11.
5. PCB8-PCB11 (Q1~Q24)
   - Verification. Refer to section 11.5.7.
   - Replacement. Refer to section 12.3.7, 12.3.8.
7. Hall C.T. (HCT1)
   - Replacement. Refer to section 12.3.27.

d) Replacement. Refer to section 12.3.

3.4 "Operating Panel Failure" (LED's do not light properly or welding setting cannot be established.)

Cause

Occurs when there is a connection failure among PCB6 (WK-5549), PCB12 (WK-5527) and PCB6 or PCB12 are defective.

Verification/Remedy

a) Verify the harness connection between CN21 on PCB6 (WK-5549) and CN2 on PCB12 (WK-5527).
- Confirm a secure connection of the harness and the connections between CN21 on PCB6 (WK-5549) and CN2 on PCB12 (WK-5527).
- Contact the manufacture if you find any broken connectors or damaged wiring harnesses.

b) Verify the connection between PCB6 (WK-5549) and PCB12 (WK-5527).

c) Replace PCB6 (WK-5549) and PCB12 (WK-5527).
- Refer to section 12.3.6, 12.3.9.

d) Verify the connection between PCB5 (WK-5551) and PCB6 (WK-5549).

e) Replace PCB5 (WK-5551) and PCB6 (WK-5549).
- Refer to section 12.3.5, 12.3.6.

3.5 "High Frequency Output Failure" (Unit does not generate High Frequency.) (300/400TS only)

Cause

Occurs when the HF. unit (HF UNIT1) is defective or blown.

Verification/Remedy

Caution

Read and understand this entire section before proceeding. Extreme personal harm and test equipment damage will occur if the procedures are not performed accurately. The unit will generate a High Voltage component that can cause extreme personal harm and test equipment damage.Capacitors installed inside the Welding Power Source are electrically charged for a while after the Mains ON/OFF switch or distribution panel switch has been turned off. Before inspecting the inside of the Welding Power Source, leave it for about 5 min. after switching off power for discharging the capacitors, and then remove the top and side panels.

a) Verify the connection between High Frequency (HF UNIT1) and Coupling Coil (CC1).
- Verify the connection between the HF UNIT1 and CC1; confirm that the quick-disconnect terminals are inserted onto the terminals of HF UNIT1 (TB5-TB6) correctly and completely.
- Confirm there are no short circuits, burnt or broken wires at CC1.
- Replace CC1.
- Refer to section 12.3.17.

b) Verify the connection between High Frequency (HF UNIT1) and the current limiting resistor (R2).
   - Verify the connection between HF UNIT1 and the current limiting resistor (R2), confirm that the quick-disconnect terminals are inserted onto the terminals of HF UNIT1 (TB3-TB4) correctly and completely.
   - Confirm there are no short circuits, burnt or broken wires between the HF UNIT1 and the current limiting resistor (R2).

c) Verify the connection between the terminals between AC1-AC2 (TB1-TB2).
   - Verify the connection between AC1-AC2, confirm that the quick-disconnect terminals are inserted onto the terminals of HF UNIT1 correctly and completely.
   - Confirm there are no short circuits, burnt or broken wires between AC1 and AC2.

d) Verify and replace the Gap (GAP) of the High Frequency (HF UNIT1).
   - Confirm that the GAP is connected to HF UNIT1 correctly and completely.
   - Confirm there is no dust or foreign debris between the space of the GAP.
   - If there are any abnormalities observed with the GAP, replace the GAP.
   - A setup of a gap is 1.0mm.
     In the case of a gap 1.0mm or more, high frequency voltage and a period increase.
     In the case of a gap 1.0mm or less, high frequency voltage and a period decrease.

e) Verify and replace the Current limiting Resistor (R6) on HF UNIT1.
   - If R6 is defective (blown, burnt, cracked, etc.), replace R6.
   - Refer to section 12.3.15.

f) Replace the High Frequency (HF UNIT1).
   - Refer to section 12.3.26.

g) Replace PCB3 (WK-5548).
   - Refer to section 12.3.3.

4 Fault Isolation Tests

4.1 Preparation

The following initial conditions must be met prior to starting any of the procedures in this section.

1) Connect the appropriate input voltage. (Check the name plate on the rear of the power supply for the proper input voltage.)

NOTE

Operate at all input voltages as noted on the nameplate on the rear panel when testing the power supply.

2) Remove the side covers. Refer to the section 11-01.
3) Close primary power source wall disconnect switch or circuit breaker.
4) Place power supply MAIN CIRCUIT SWITCH (S1) on rear of the unit in the ON position.

WARNING

Dangerous voltage and power levels are present inside this unit. Be sure the operator is equipped with proper gloves, clothing and eye and ear protection. Make sure no part of the operator's body comes into contact with the work piece or any internal components while the unit is activated.

5 Verification of the Power Input Circuitry

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

5.1 Verification of the AC Input Voltage using an AC voltmeter.

1) Verify input voltage (Phase-to Phase) using an AC voltmeter. (The capability of the voltmeter should be more than 600VAC). Measure the point between lines U1 and V1 on the input switch, S1.Measure the point between lines U1 and W1 on the input switch, S1. Measure the point between lines V1 and W1 on the input switch, S1. The location of points U1, V1 and W1on switch S1 are indicated in Figure 11-7. When using a single-phase connection, the voltage can be verified only between U1 and V1.

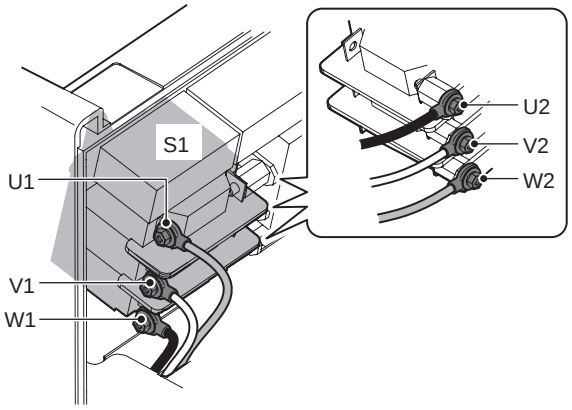


Figure 11-7: Check points U1, U2, V1, V2, W1 and W2

2) If the input voltage is out of the operating range of the unit, which is ±10% (187 ? 253/414 ? 506 VAC) of the rated voltage (208, 230/460V), verify the available power capacity at the installed site. If the input voltage is within the operating range, recheck the input voltage while welding, as welding may cause the input voltage to decrease to a value below the operating range of the unit.

3) Verify input voltage after the input switch (S1) using an AC voltmeter. (The capability of the voltmeter should be more than 600VAC.)

   ? Using an AC voltmeter, measure between the points U2 and V2 on the input switch, S1.

   ? Using an AC voltmeter, measure between the points U2 and W2 on the input switch, S1.

   ? Using an AC voltmeter, measure between the points V2 and W2 on the input switch, S1.

   The location of points U2, V2 and W2 on switch S1are indicated in Figure 11-7. When using a single-phase connection, the voltage can be verified only between U2 and V2.

4) If this voltage is out of the operating range, which is ±10% (187 ? 253/414 ? 506 VAC) of the rated voltage (208, 230/460V), replace S1 following the process in section 12.3.23.

5) Verify the rectified output voltage of the input diode, D1 using a DC voltmeter. (The capability of the voltmeter should be more than 1000VDC.) Using a DC voltmeter, measure between the points 1 (P) [+] and 2 (N) [-] on D1. Points 1 (P) and 2 (N) are on D1. See Figure 11-8. The measured voltage should be approximately 1.4 times larger than input voltage measured in #1 above. Replace diode D1 if the calculated measurement is not within the coresponding range (260 ? 360/580 ? 720 VDC) following the process in section 12.3.28.

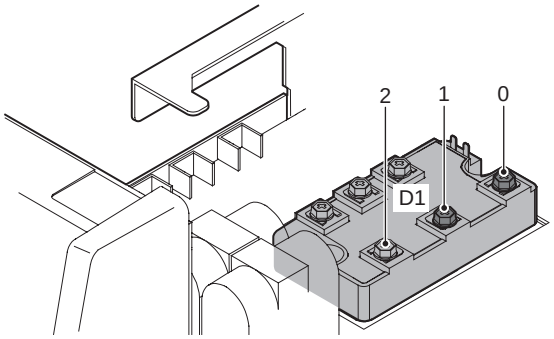


Figure 11-8: The check points 1 (P) and 2 (N)

6) Verify bus voltage (the voltage of the electrolytic capacitor after rectification) using a DC Voltmeter. The capacity of the DVM should be more than 1000VDC.
Measure between the output studs C and E on PCB8 (WK5479), PCB9 (WK5479), PCB10 (WK5479) and PCB11 (WK5479).
The measured voltage should be approximately 1.4 times larger than the input voltage measured in step 1 (above), except when running at 460V where the bus voltage will be shared across all boards, i.e., each board receiving 0.7 times the input voltage measured in step 1 (above). Replace diode D1 if the calculated measurement is not within the corresponding range (260 ~ 360/580 ~ 720VDC). Follow the process in 12.3.28.

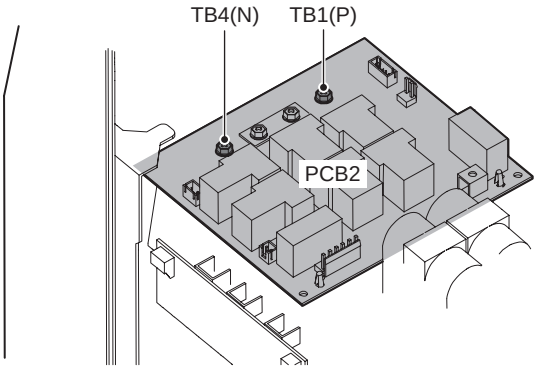


Figure 11-9: The check points TB1(P) and TB2(N)

7) After the replacement of D1, if the above voltage is still abnormal, replace PCB1 (WK-5493).

5.2 Verification of the Power Supply Voltage

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of an above section "1.Preparation".

1) Verify Power Supply voltage using an DC voltmeter. (The capability of the voltmeter should be more than 50VDC.) Operate at all input voltages as noted on the nameplate on the rear panel when testing the power supply.

2) On the PCB3 (WK-5548) and PCB6 (WK-5549), measure the voltages according to the following table. The check points and the reference are obtainable on the solder side of PCB4 (WK-4819). The locations of points are indicated in Figure 11-10, 11-11.

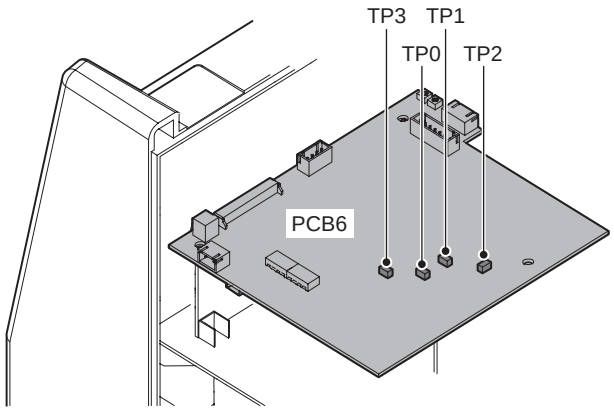


Figure 11-10: Checkpoints TP0-TP3 on PCB6

Check Point PCB6	Reference PCB6	ACCEPTABLE VALUE
TP1	TP0	+5VDC
TP2	TP0	+15VDC
TP3	TP0	-15VDC

Table 11-1: Checkpoints TP0-TP3 on PCB6

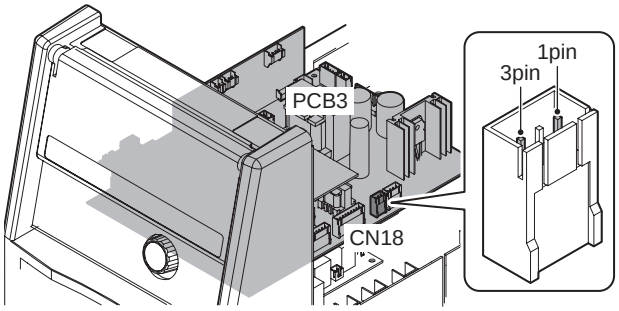


Figure 11-11: Checkpoints CN18 on PCB3

Check Point PCB3	Reference PCB3	ACCEPTABLE VALUE
Pin 1 on CN18	Pin 3 on CN18	+24VDC

Table 11-2: Checkpoints CN18 on PCB3

3) If any of these voltages are not present or are below a 10% tolerance, replace the PCB3 (WK-5548). Refer to section 12.3.3.

5.3 Verification of the Cooling Fan, FAN1, Drive Circuitry

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

1) Verify the condition of the cooling fan, FAN1, using a DC voltmeter. (The capability of the voltmeter should be more than 50VDC.) Using a DC voltmeter, measure between PIN 1 (Positive [+]) and PIN 2 (Negative [-]) of CN11 on PCB3 (WK-5548). The location of connector CN11 of PCB3 is indicated in Figure 11-12. When you measure the above voltage, do not remove the connector. Conduct the measurement while the connector plug and receptacle are still connected.

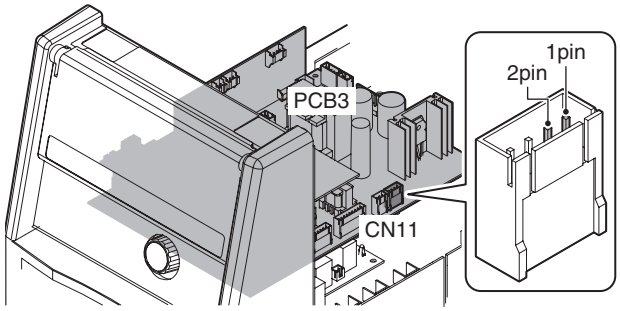


Figure 11-12: Verification of the FAN1

2) Using the measurement taken above, follow the chart below for possible failure modes.

	FAN1 Status	Voltage measurement. (1PIN-2PIN of CN11 on PCB3)	Remedy
Case 1	Rotating	DC 18 ~ 25V	FAN1 drive circuit is normal.
Case 2	Rotating	Below DC 18V	Replace PCB3. Refer to section 12.3.3.
Case 3	Inactive	Below DC 18V	Replace PCB3. Refer to section 12.3.3. ↓ Perform "Verification of the Power Supply Voltage". Refer to section 11.5.2.
Case 4	Inactive	DC 18 ~ 25V	Replace the FAN1. Refer to section 12.3.21.

Table 11-3: Verification of the FAN1

- At the time of a low output and standby, as for this equipment, rotation of a fan becomes slow. Therefore, exact voltage measuring becomes impossible. Perform the check of voltage in the state of abnormalities.
- When verifying the voltage, confirm that the AC input voltage remain within the operating range of the unit. (The AC input does not drop below 180VAC).

5.4 Verification of the Gas Valve, SOL1, Drive Circuitry

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

1) Verify the voltage between the PIN 3 (Positive [+]) and PIN 4 (Negative [-]) of connector CN11 on PCB3 (WK-5548) while you press the torch switch while in TIG Mode. (The capacity of the voltmeter should be more than 50VDC.) The location of connector CN11 of PCB3 (WK-5548) is indicated in Figure 11-13. When you measure the above voltage, do not remove the connector. Conduct the measurement while the connector plug and receptacle are still connected.

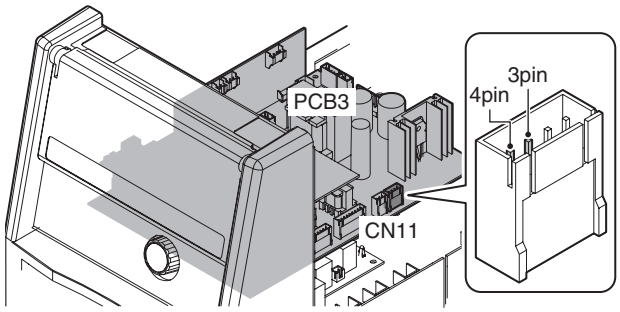


Figure 11-13: Verification of the SOL1

2) Using the measurement taken above, follow the chart below for possible failure modes.

	Voltage measurement. (PIN 1-PIN 2 of CN11 on PCB3)	Remedy
Case 1	Below DC 18V	Replace PCB1. Refer to the page 12-23.
Case 2	DC 18 ~ 25V	Replace SOL1. Refer to the page 12-23.

Table 11-4: Verification of the SOL1

3) When verifying the voltage, confirm that the AC input voltage remain within the operating range of the unit.
(The AC input does not drop below 180VAC).

5.5 Verification of the primary Diode (D1)

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

1) Verify the characteristic of the primary diode, D1, using a diode tester.
2) Refer to Table 11-5 and Figure 11-14 for the checkpoints on D1.

COMPONENT TESTED	TERMINALS		ACCEPTABLE VALUE
	Positive lead	Negative lead	
Diode of D1	3, 4, 5 0	0 3, 4, 5	0.3 to 0.5V Open
Diode of D1	3, 4, 5 2	2 3, 4, 5	Open 0.3 to 0.5V
Thyristor of D1	0 1	1 0	Open Open
Gate of D1	6	7	52 +3, ±3ohms

Table 11-5: Tester checkpoints in D1

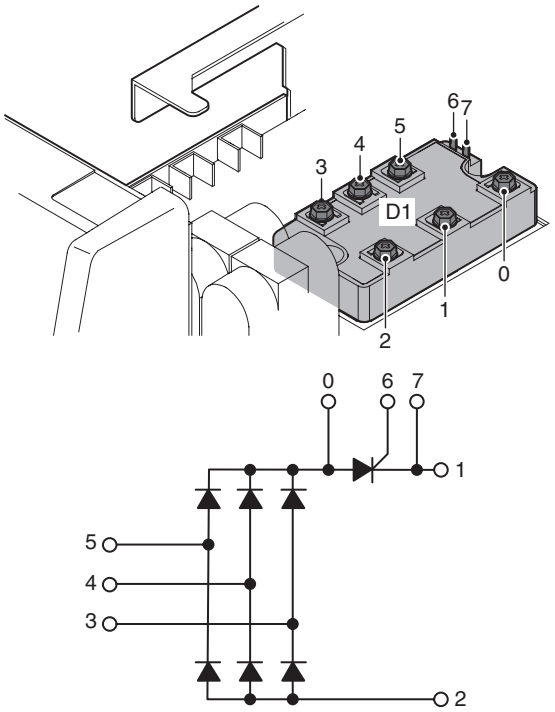


Figure 11-14: Tester checkpoints for D1 showing the interconnection diagrams

5.6 Verification of the secondary Diode (D2-D7)

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

1) Verify the characteristic of the secondary diode, D2-D7, using a diode tester.
2) Refer to Table 11-6 and Figure 11-15 for the checkpoints on D2-D7.

COMPONENT TESTED	TERMINALS		ACCEPTABLE VALUE
	Positive lead	Negative lead	
Diode 1 of D2-D7	Anode Cathode	Cathode Anode	0.2 to 0.3V Open
Diode 2 of D2-D7	Anode Cathode	Cathode Anode	0.2 to 0.3V Open

Table 11-6: Tester checkpoints for D2-D7

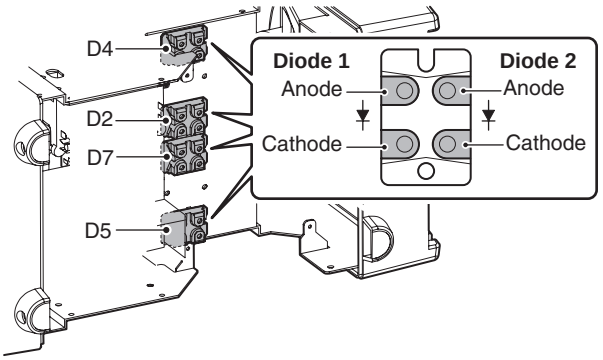


Figure 11-15: Tester checkpoints for D2-D7

5.7 Verification of the primary IGBT (Q1-Q24)

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of an above section "1.Preparation". Refer to section 11.04.

1) Check whether there are any abnormalities on the appearance of PCB8-PCB11.
2) Verify the characteristic of the primary IGBT (Q1-Q24), using a diode tester.
3) Refer to Table 11-7 and Figure 11-16 for the checkpoints on PCB8-PCB11.

COMPONENT TESTED	TERMINALS		ACCEPTABLE VALUE
	Positive lead	Negative lead	
Collector-Emitter of Q1~Q12 with PCB8 and PCB9	C CE	CE C	Open 0.2 to 0.5V
Collector-Emitter of Q13~Q24 with PCB10 and PCB11	CE E	E CE	Open 0.2 to 0.5V

Table 11-7: Tester checkpoints in the Q1-Q24

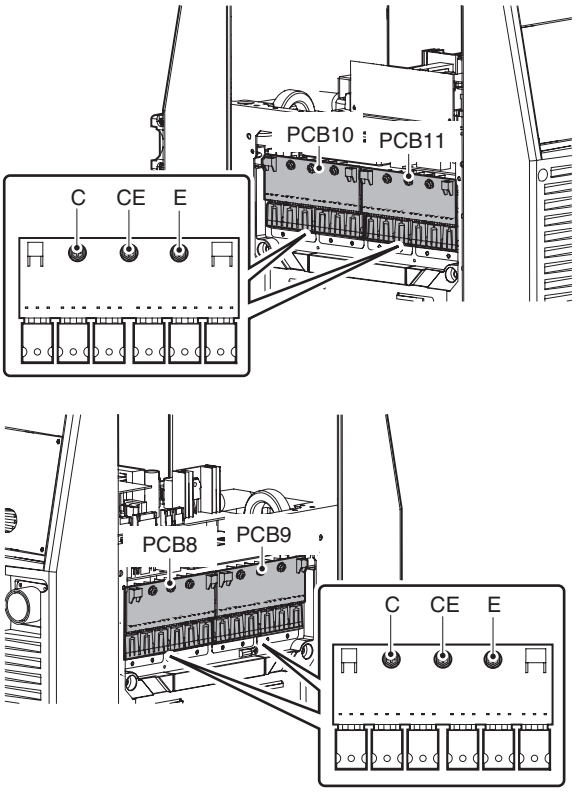


Figure 11-16: Tester checkpoints for Q1-Q24

5.8 Verification of the secondary IGBT (Q25-Q26)

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of section 11.4.1 " Preparation" on page 11-10.

1) Check whether there are any abnormalities on the appearance of PCB17.
2) Verify the characteristic of the secondary IGBT (Q25-Q26), using a diode tester.
3) Refer bellow Table 11-8 and Figure 11-17 for the checkpoints on Q25-Q26.

COMPONENT TESTED	TERMINALS		ACCEPTABLE VALUE
	Positive lead	Negative lead	
Collector-Emitter of Q25 (By PCB18 connection)	C1 C2E1	C2E1 C1	Open 0.2 to 0.5V
Collector-Emitter of Q26 (By PCB19 connection)	C2E1 E2	E2 C2E1	Open 0.2 to 0.5V

Table 11-8: Tester checkpoints for Q25-Q26

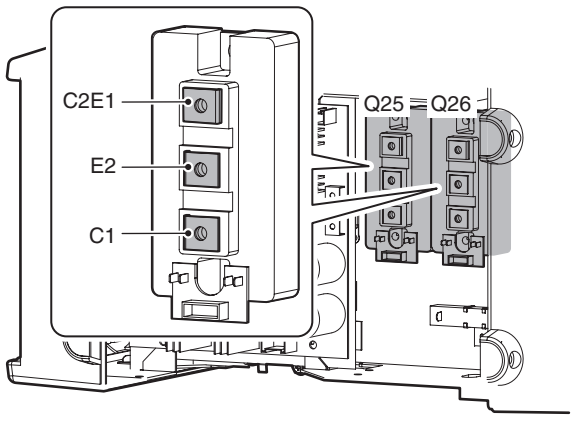


Figure 11-17: Tester checkpoints in the Q25-Q26

5.9 Verification of No-load Voltage (OCV)

CAUTION

Before performing any portion of the procedure below, make certain the unit is placed in the initial set up condition as described at the beginning of an above section "1.Preparation". Refer to tsection 11.04.

a. Verify the no-load voltage in STICK mode.
   1) In STICK welding mode, mark and then turn potentiometer VR1 on PCB6 (WK-5549) all the way to the right and turn off the electric shock protector function (Voltage-Reduction-Device, VRD).
   2) Contactor function is put into the state of on pushing Function button.

WARNING

Electric shock hazard. The unit will generate OCV immediately when contactor function is put into the state of on pushing Function button at STICK mode.

   3) Verify the no-load voltage using a DC voltmeter.
   (The capability of the voltmeter should be more than 100VDC.)
   4) The normal no-load voltage is approximately 65V.

b. Verify the no-load voltage (OCV) in High Frequency TIG mode.

WARNING

This welding mode produces high frequency and high voltage. Extra care shall be taken to prevent electric shock.

1) When in HF TIG mode, the unit will generate high voltage. To prevent personal harm and test equipment damage, mark and then remove the indicated wire from the HF UNIT1 shown in Figure 11-18. To prevent electric shock, always wrap the removed wire with electrical tape or other suitable insulation.

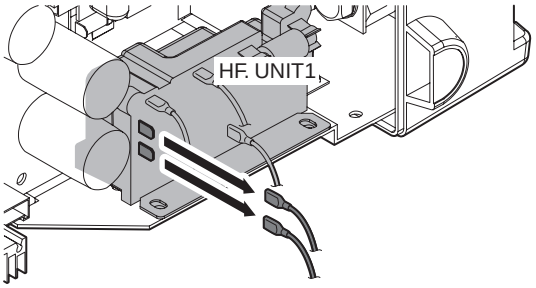
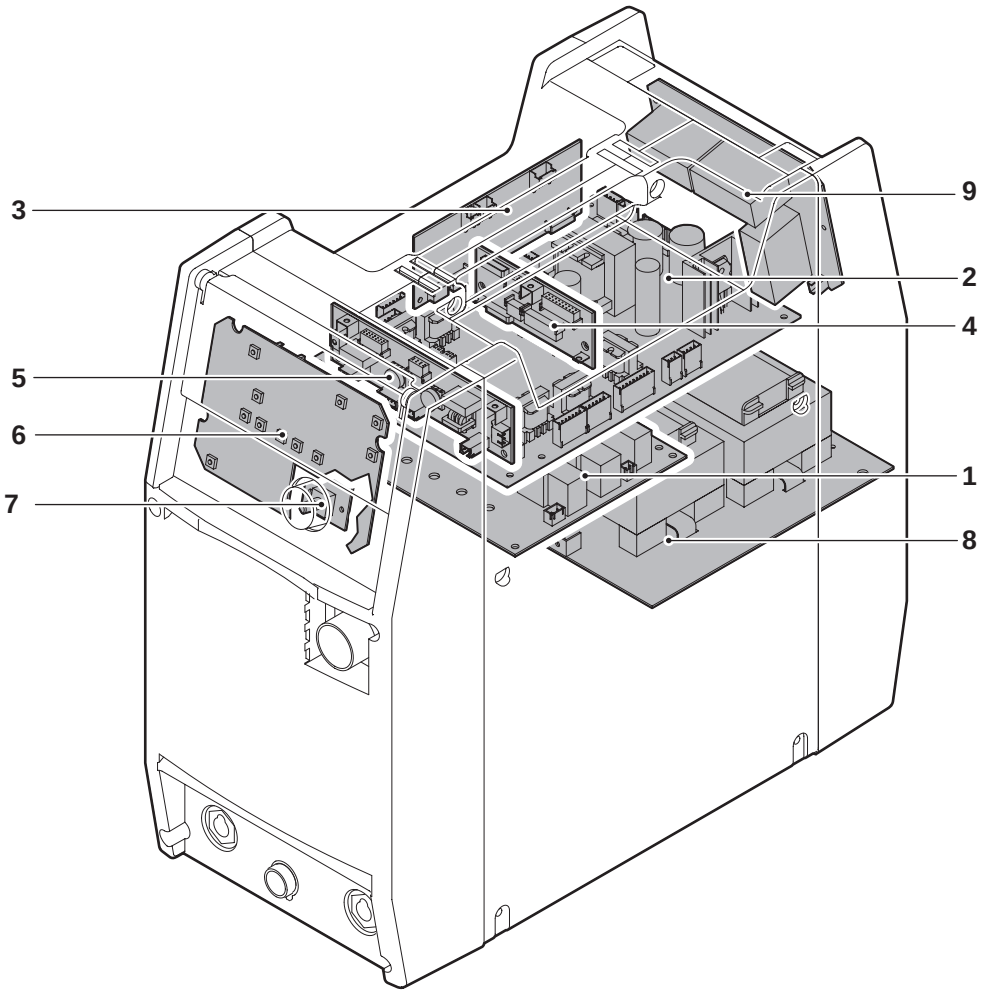


Figure 11-18: Removal and installation from the HF UNIT1 (To disable the operation of the HF unit.)

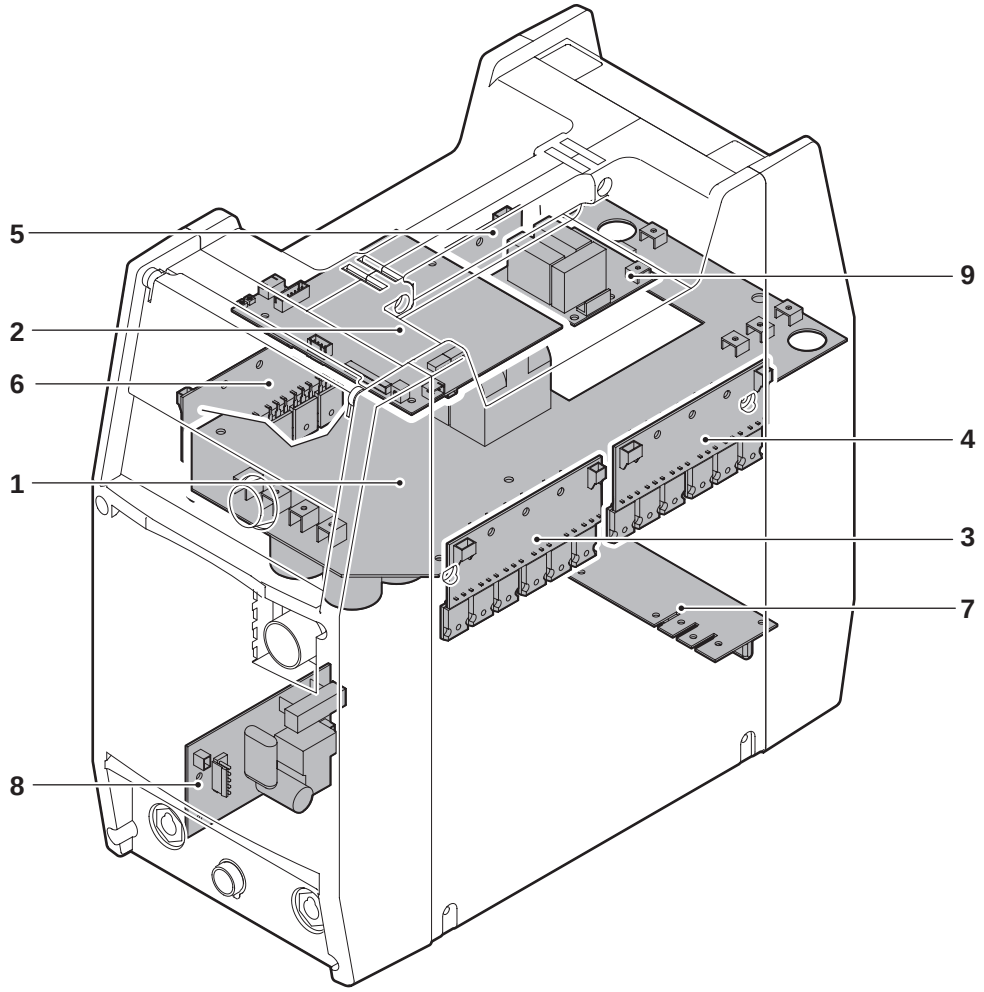
2) Press the Welding mode selection button to select HF TIG welding mode.
3) While depressing the Torch switch, verify the OCV using a DC voltmeter. (The capability of the voltmeter should be more than 100VDC.) The check point with a tester is the voltage between output terminal + and -. In TIG mode, the OCV ceases 3 seconds after you depress the torch switch.
4) The normal no-load voltage is approximately 65V.
5) Return the setting variable resister (VR1) to the original position. (Return to the position recorded by "a. 1)" clause.)
   - fully clockwise: VRD ON
   - fully counter-clockwise: VRD OFF
6) Return connection with HF UNIT1 to the original position.

12 MAINTENANCE

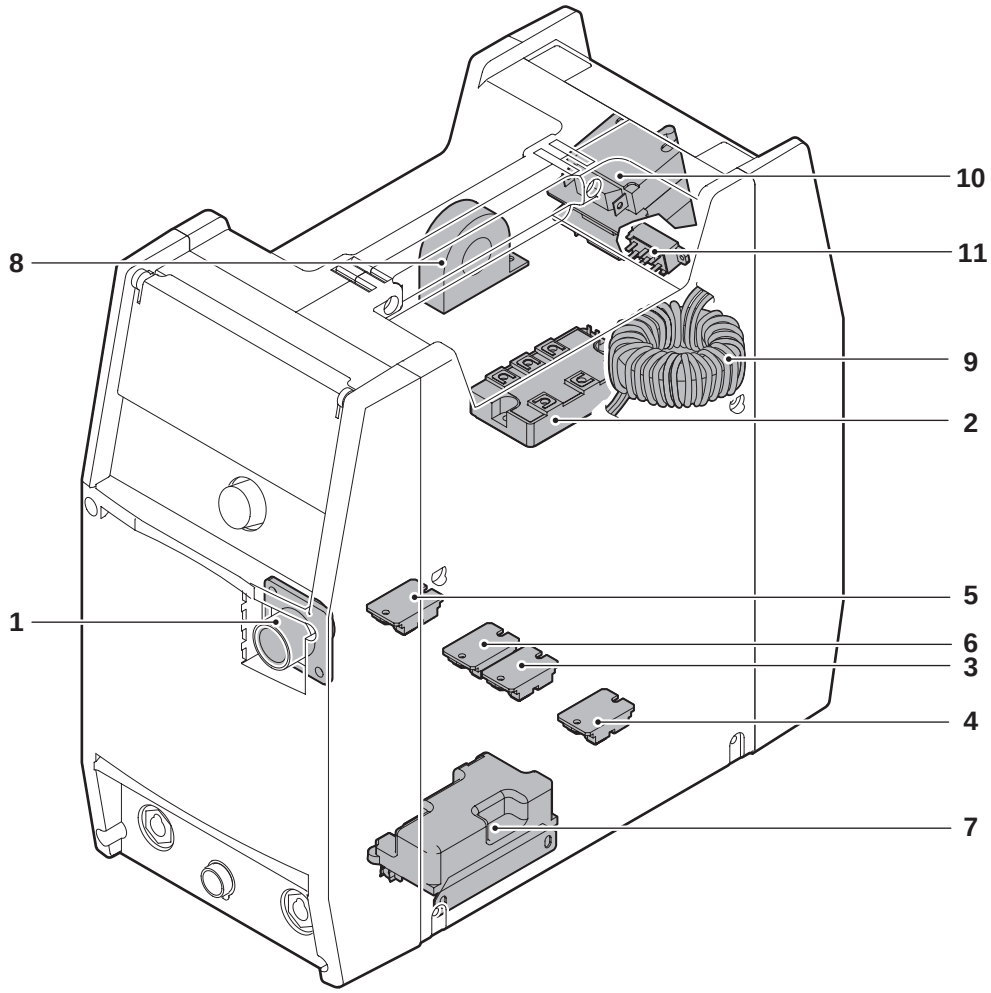
1 Maintenance List



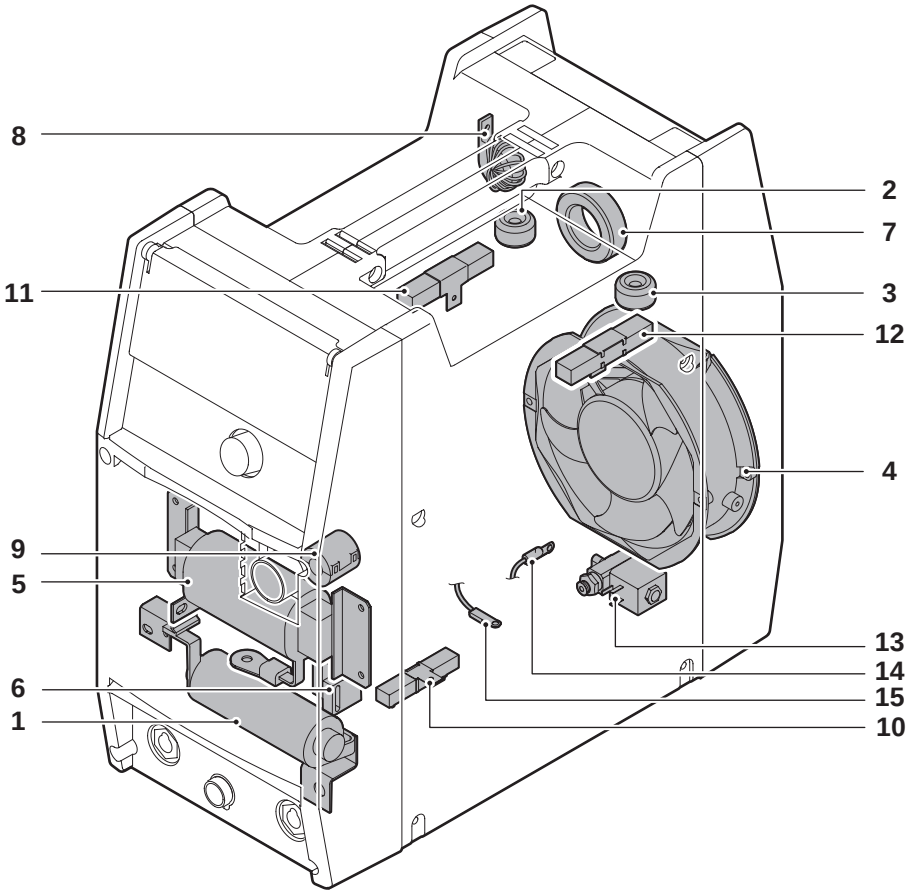
No.	DWG No.	Parts name	Reference page	Note
1	PCB2	Print Circuit Board (WK-5597)	12- 8	
2	PCB3	Print Circuit Board (WK-5548)	12- 9	
3	PCB4	Print Circuit Board (WK-4819)	12-11	
4	PCB5	Print Circuit Board (WK-5551)	12-11	
5	PCB7	Print Circuit Board (WK-5550)	12- 9	
6	PCB12	Print Circuit Board (WK-5527)	12-14	
7	PCB13	Print Circuit Board (WK-5528)	12-15	
8	PCB14	Print Circuit Board (WK-5594)	12-16	
9	PCB21	Print Circuit Board (WK-4917)	12-18	



No.	DWG No.	Parts name	Reference page	Note
1	PCB1	Print Circuit Board (WK-5493)	12-6	
2	PCB6	Print Circuit Board (WK-5549)	12-11	
3	PCB8 (Q1-Q6)	Print Circuit Board (WK-5479) (Primary IGBT)	12-12	
4	PCB9 (Q7-Q12)	Print Circuit Board (WK-5479) (Primary IGBT)	12-12	
5	PCB10 (Q13Q18)	Print Circuit Board (WK-5479) (Primary IGBT)	12-14	
6	PCB11 (Q19-Q24)	Print Circuit Board (WK-5479) (Primary IGBT)	12-14	
7	PCB15	Print Circuit Board (WK-5606)	12-17	
8	PCB20	Print Circuit Board (WK-5499)	12-18	
9	PCB22	Print Circuit Board (WK-5022)	12-20	



No.	DWG No.	Parts name	Reference page	Note
1	CON1	Remote Socket	12-29	
2	D1	Primary Diode	12-31	
3	D2	Secondary Diode	12-32	
4	D4	Secondary Diode	12-32	
5	D5	Secondary Diode	12-32	
6	D7	Secondary Diode	12-32	
7	HF.UNIT1	High Frequency Unit	12-29	300/400TS/ only
8	L101	Reactor	12-37	
9	L102	Reactor	12-38	
10	S1	Main ON/OFF Switch	12-27	
11	S2	Input Voltage Switch	12-28	

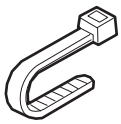
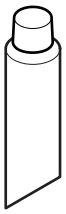


No.	DWG No.	Parts name	Reference page	Note
1	CC1	Coupling Coil	12-23	300/400TS/ only
2	CT2	Current Trans	12-33	
3	CT3	Current Trans	12-33	
4	FAN1	Cooling Fan	12-25	
5	FCH1	Reactor	12-23	
6	HCT1	Hall Current Sensor	12-30	
7	L1	Ring Core	12-34	
8	L103	Reactor	12-39	
9	L105	Ring Core	12-36	
10	R6	Current Limiting Resistor	12-20	300/400TS/ only
11	R7	Resistor	12-21	
12	R8	Resistor	12-21	
13	SOL1	Solenoid Valve	12-26	300/400TS/ only
14	TH1	Primary Thermistor	12-24	
15	TH2	Secondary Thermistor	12-25	

2 Service Tools

2.1 Tools and parts

The tools and parts to be used for maintenance are shown by icons.

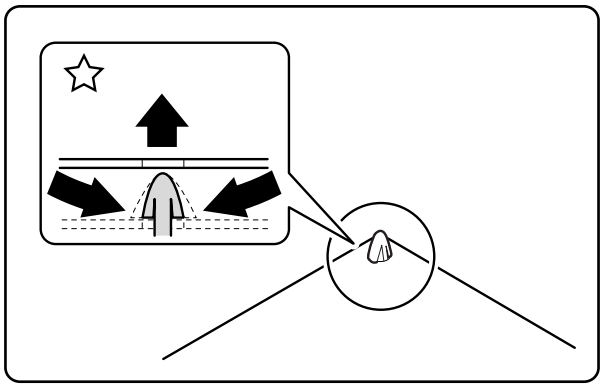
Spanner	Philips Head Screwdriver	Long Nose Pliers	C-Ring Pliers	Snap Band	Silicon Compound
					

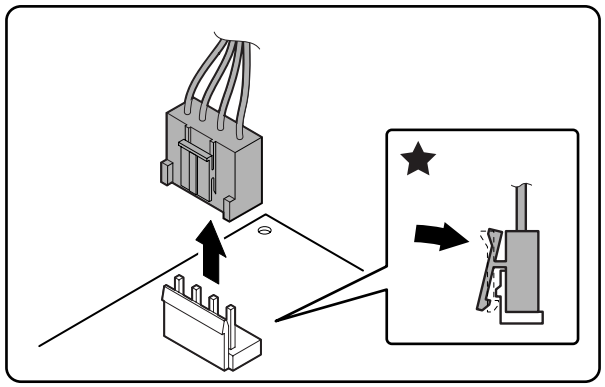
2.2 Notes of disassembly and assembly

NOTE

When removing the locking type connectors and board supporters, disengage the locking mechanism first and then disconnect them.

Locking type connectors and board supporters are indicated in this manual using the following symbols; black star marks for locking connectors and white star marks for locking board supports.





NOTE

During your maintenance or repair, please cut any tie-wraps necessary. However, after your maintenance or repair, please reassemble and tie-wrap all components and wiring in the same manner as before the maintenance or repair.

CAUTION

Please note that you remove each connector, grasp and pull out by the connector part only. Do not pull the harness (cable) part.

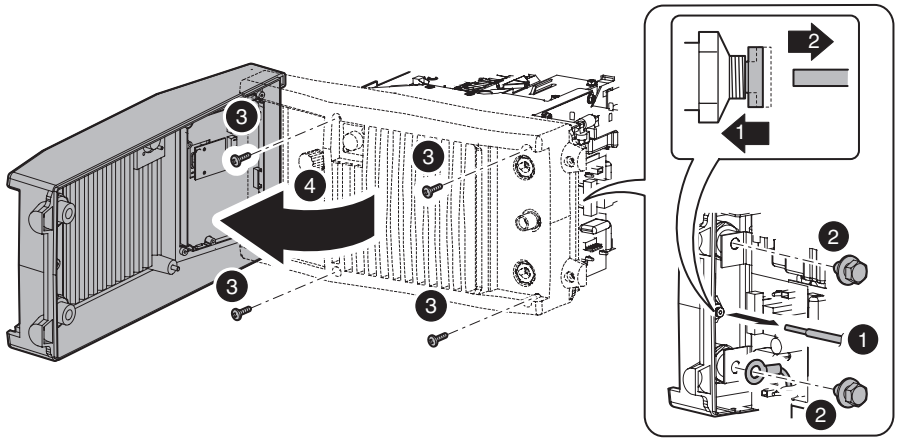
WARNING

The capacitors inside the power supply will slowly discharged after you turn off the switch of the power supply or the switch at the breaker box (distribution panel). Wait at least 5 minutes for the discharge to complete.

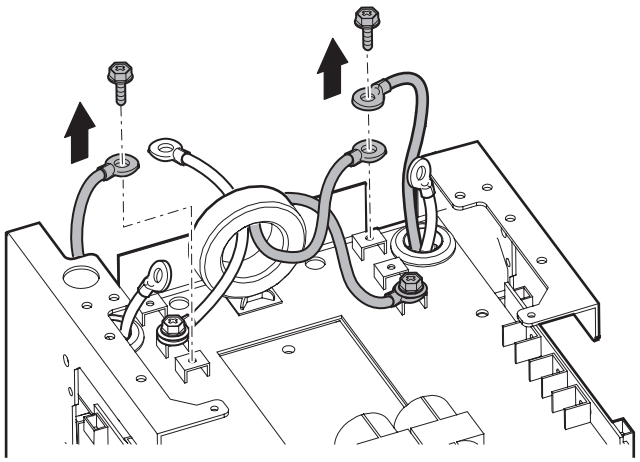
3 Replacement Procedure

3.1 PCB1 (WK-5493)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB2 (WK-5597). [Reference page : 12-8]
3) Remove the Primary Diode (D1). [Reference page : 12-31]
4) Remove the Current Trans (CT2/CT3). [Reference page : 12-33]
5) Remove the Nylon Hose. Remove the two bolts, and one terminal.
   Remove the four screws and open the front cabinet.

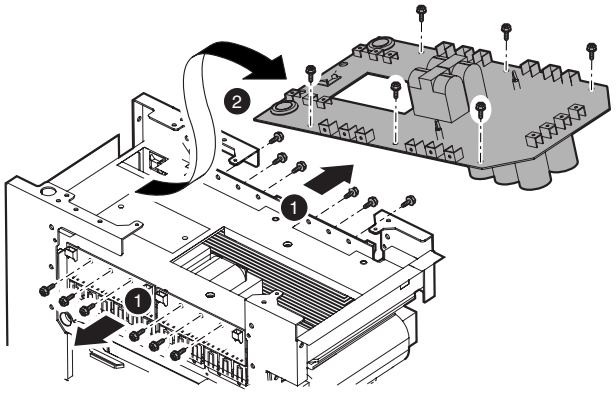


6) Remove the two screws and three terminals from the PCB1 (WK-5493).



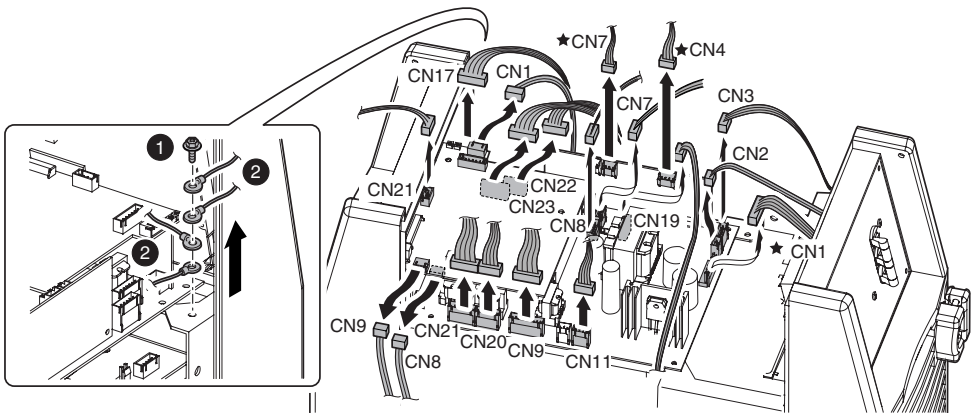
7) Remove the Reactor (L1). [Reference page : 12-34]

8) Remove the 18 screws and remove the PCB1 (WK-5493).

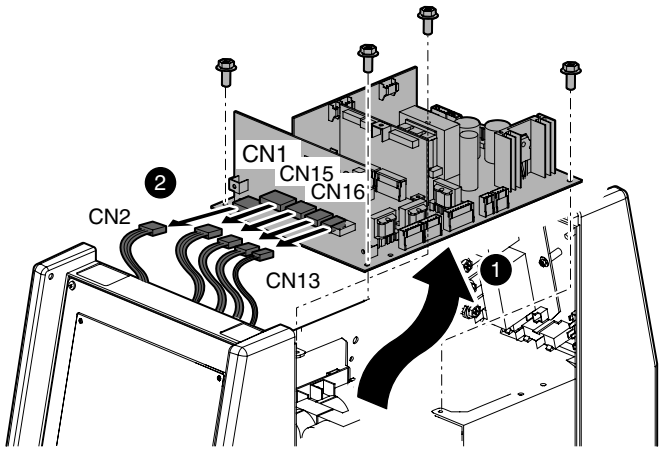


3.2 PCB2 (WK-5597)

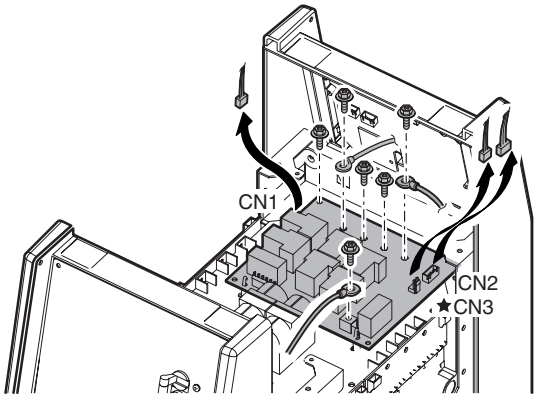
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the screw and then disconnect the four ground terminals. Disconnect the 19 connectors.



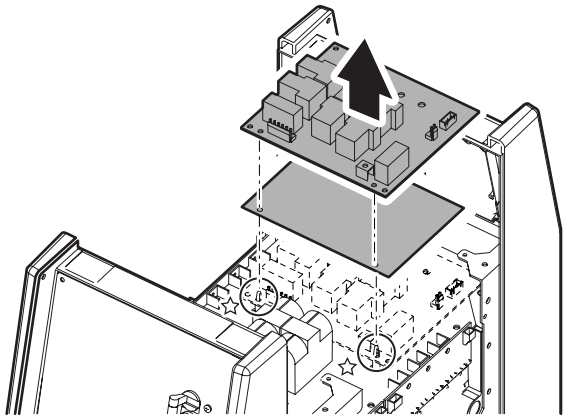
3) Remove the four screws. Remove the PCB3, PCB4, PCB5, PCB6, and PCB7 unit. Disconnect the three connectors.



4) Remove the six screws, three terminals and three connectors.

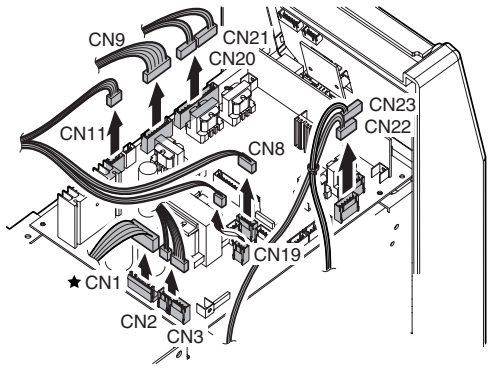


5) Remove the two PCB supporters and then the PCB2 (WK-5597) and insulation sheet.

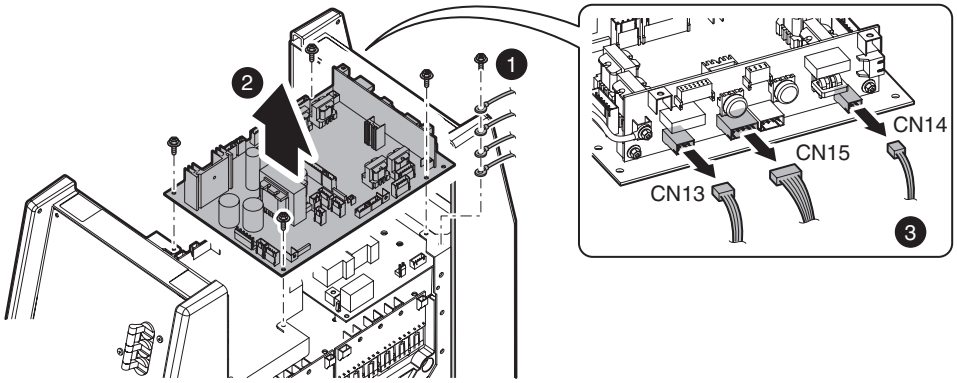


3.3 PCB3 (WK-5548), PCB7 (WK-5550)

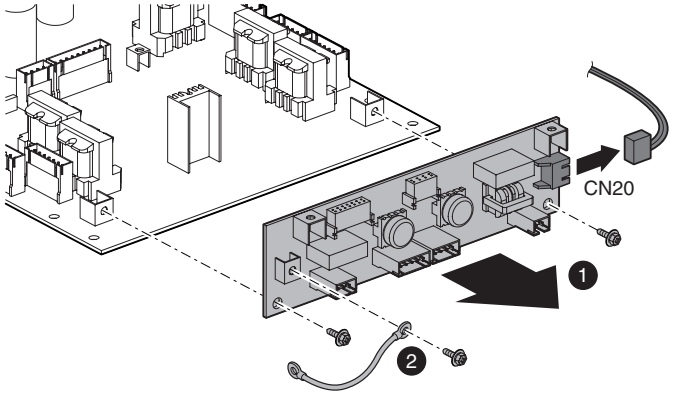
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB4 (WK-4819). [Reference page : 12-11]
3) Remove the PCB6 (WK-5549). [Reference page : 12-11]
4) Remove the PCB5 (WK-5551). [Reference page : 12-11]
5) Disconnect the 11 connectors from the PCB3 (WK-5548).



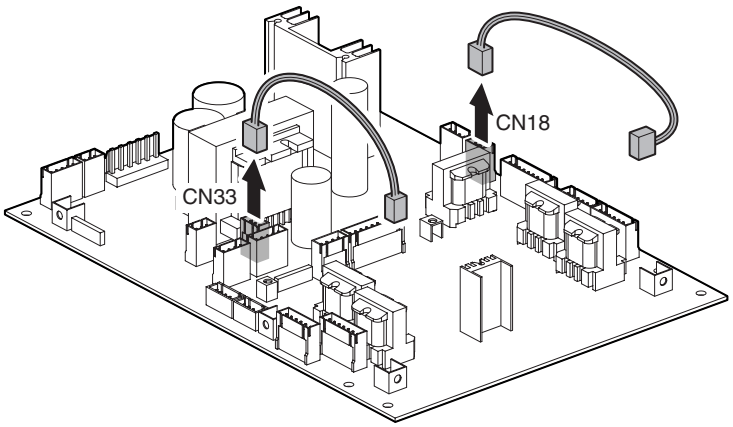
6) Remove the screw and then the four ground terminals. Remove the four screws and then remove the PCB3 and PCB7 unit. Disconnect the three connectors from the PCB7 (WK-5550).



7) Disconnect the one connector and remove the two screws, and then remove the PCB7 (WK-5550) from the PCB3 (WK-5548). Remove one screw and one ground terminal from the PCB7 (WK-5550).

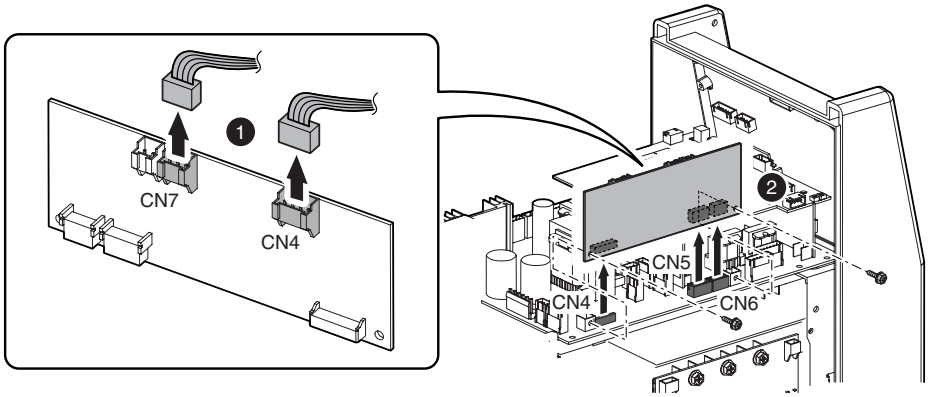


8) Disconnect the two connectors from the PCB3 (WK-5548).



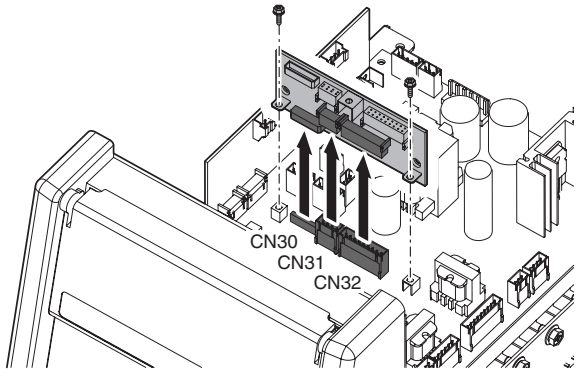
3.4 PCB4 (WK-4819)

1) Remove the Side Panel. [Reference page : 11-1]
2) Disconnect the two connectors. Remove the two screws and three connectors and remove the PCB4 (WK-4819) from the PCB3 (WK-5548).



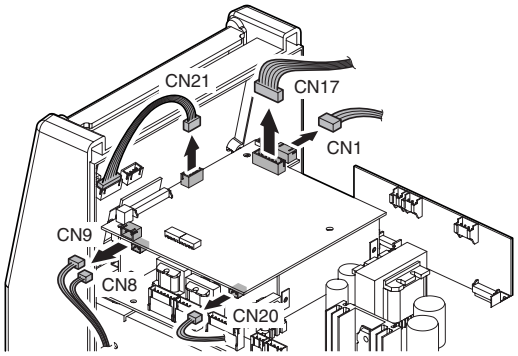
3.5 PCB5 (WK-5551)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB6 (WK-5549). [Reference page : 12-11]
3) Remove the two screws and three connectors. Remove the PCB5 (WK-5551) from the PCB3 (WK-5548).

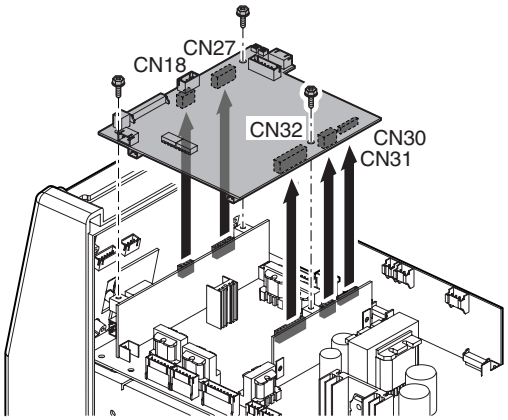


3.6 PCB6 (WK-5549)

1) Remove the Side Panel. [Reference page :11-1]
2) Disconnect the six connectors.

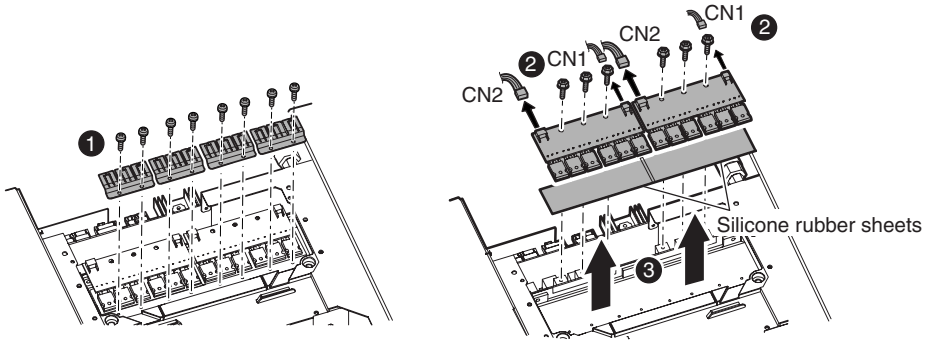


3) Remove the three screws and five connectors. Remove the PCB6 (WK-5549) from the PCB5 (WK-5551) and PCB7 (WK-5550).



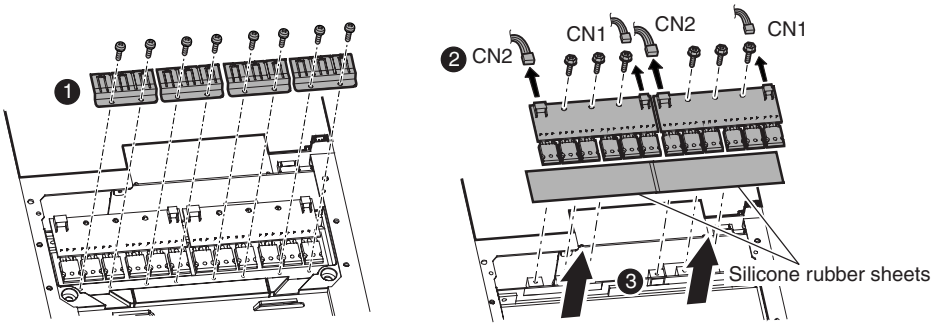
3.7 PCB8, PCB9 (WK-5479) and Q1-Q12 "Primary IGBT"

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the eight screws and four device clips. Remove the four connectors and six screws. Remove the PCB8 (WK-5479) and PCB9 (WK-5479).
   - Remember to install Silicone Rubber Sheets where silicone compound (Shinetsu silicone G-747 or equivalent) was spread when reinstalling the PCB8 and PCB9. Spread the silicone compound on IGBT.



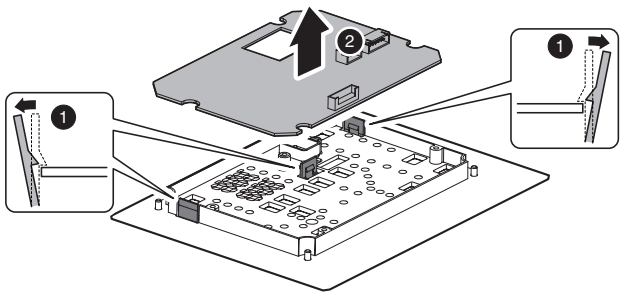
3.8 PCB10, PCB11 (WK-5479) and Q13-Q24 "Primary IGBT" ⊕

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the eight screws and four device clips.
   Remove the four connectors and six screws. Remove the PCB10 (WK-5479) and PCB11 (WK-5479).
   - Remember to install Silicone Rubber Sheets where silicone compound (Shinetsu silicone G-747 or equivalent) was spread when reinstalling the PCB10 and PCB11. Spread the silicone compound on IGBT.

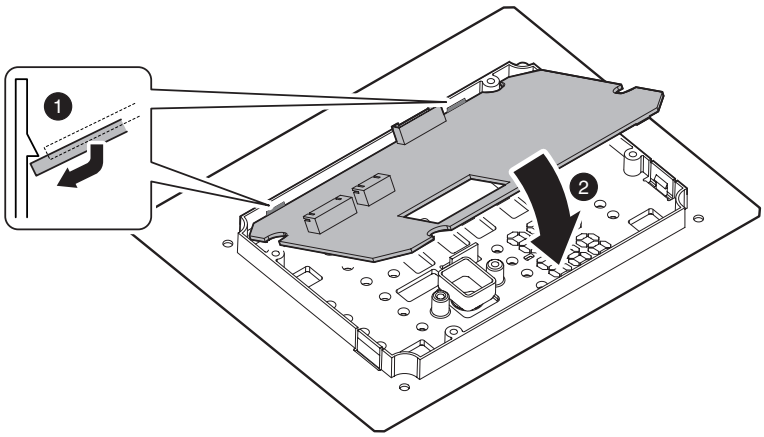


3.9 PCB12 (WK-5527) ⊕

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB13 (WK-5528). [Reference page :12-15]
3) Remove the three latches of Front Control Cover and then the PCB12 (WK-5527).

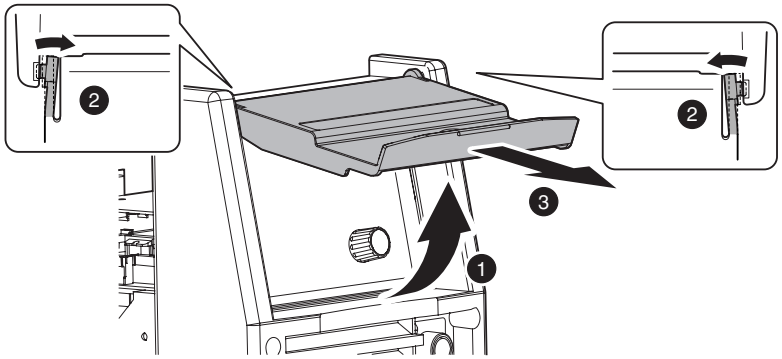


- When reinstalling the PCB12 (WK-5527), engage two latches of Front Control Cover first.

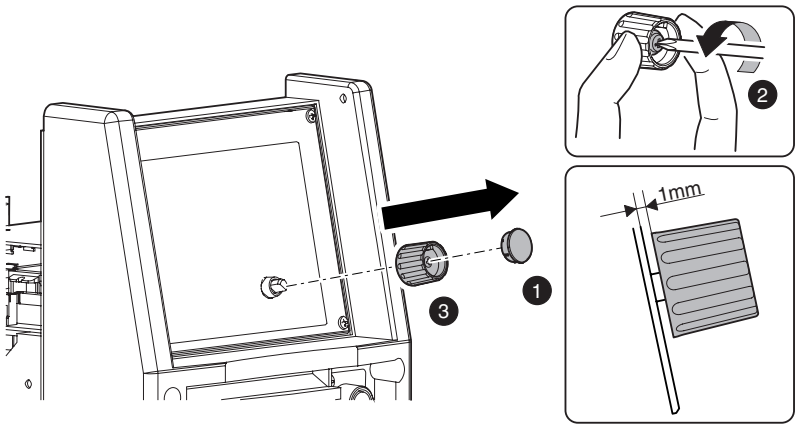


3.10 PCB13 (WK-5528)

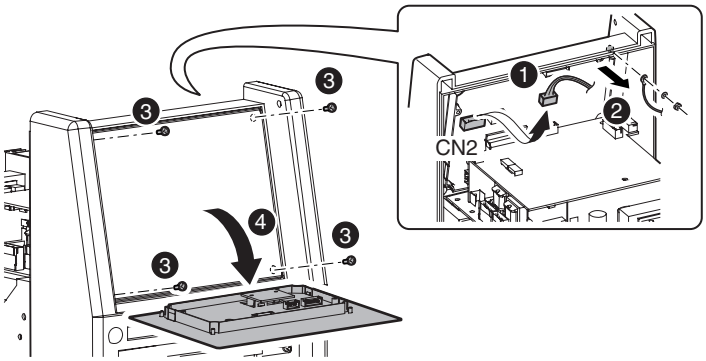
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Protection Cover.



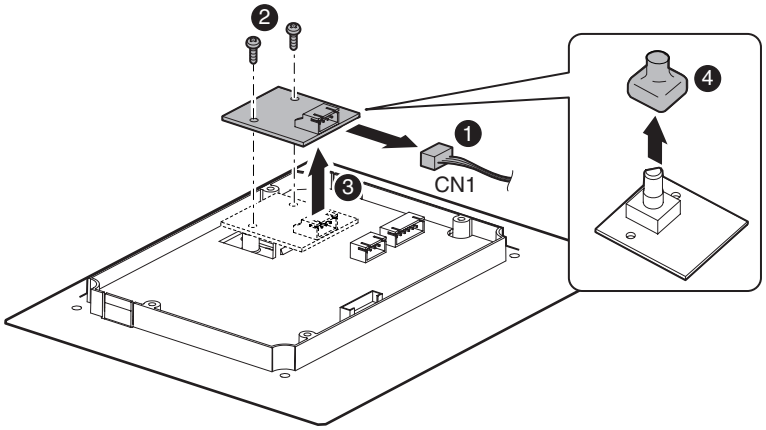
3) Remove the Knob Cap. Holding the Knob down, loosen the screw and remove the Knob.



4) Disconnect the one connector from the PCB12 (WK-5527).
Remove the nut, washer and terminal. Remove the four screws.
Pull out the Operation Panel and bring it down.

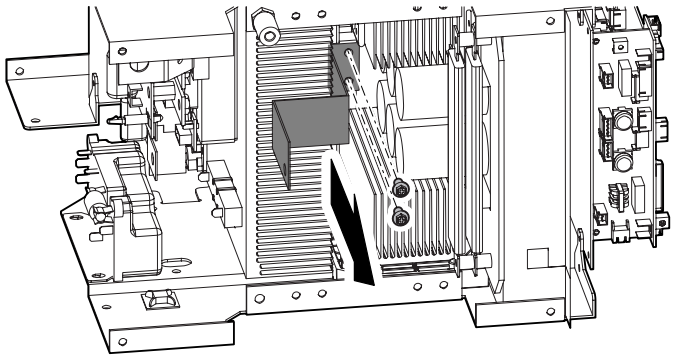


5) Remove the one connector and two screws. Remove the PCB13 (WK-5528) and Encoder Cover.

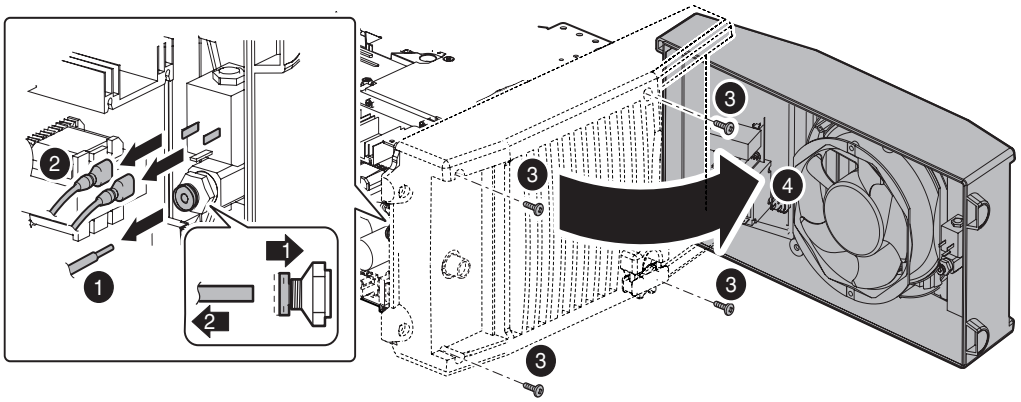


3.11 PCB14 (WK-5594) <T1 "Main Transformer">

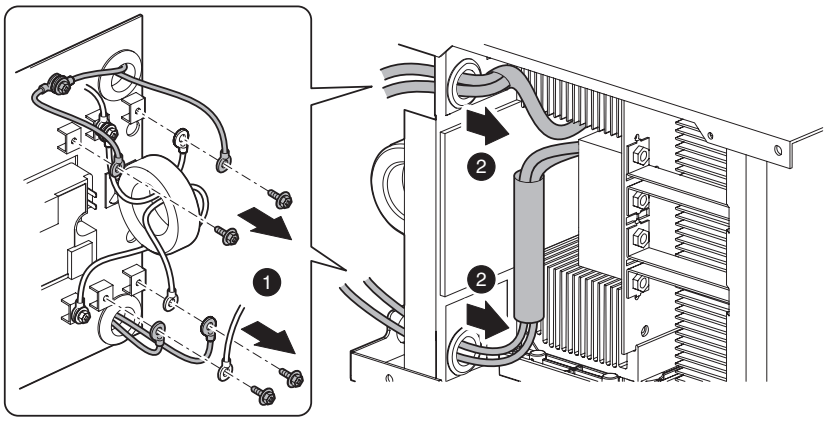
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Coupling Coil (CC1). [Reference page : 12-23]
3) Remove the PCB20 (WK-5499). [Reference page : 12-18]
4) Remove the Reactor (FCH1). [Reference page : 12-23]
5) Remove the two screws and the T-CC Bus Bar from the front side.



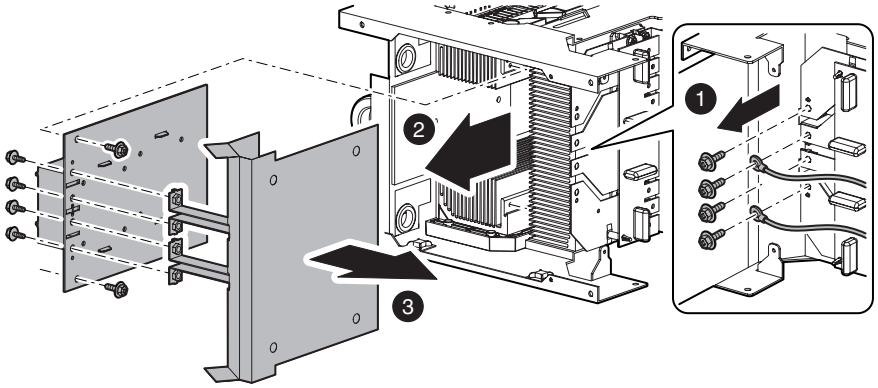
6) Remove the Nylon Hose and two terminals of SOL1. Remove the four screws and open the Rear Panel.



7) Remove the four screws from the PCB1 (WK-5477). Remove the seven terminals. The cables is drawn out.

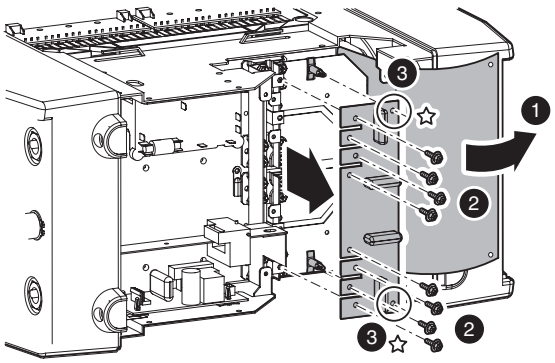


8) Remove the four screws and then two cables from bottom. Remove the two screws and then drags out the PCB14 (WK-5594) and D Bus Bar1, D Bus Bar2, D Bus Bar3, D Bus Bar4 and Dust Cover Sheet (Rear). Remove the four screws and then remove the D Bus Bar1, D Bus Bar2, D Bus Bar3, D Bus Bar4 and Dust Cover Sheet (Rear) form PCB14.



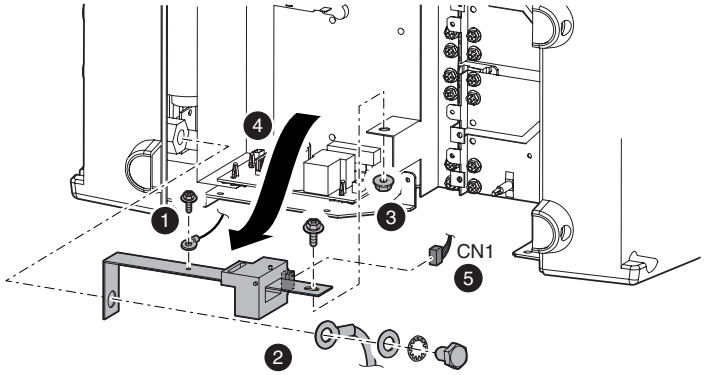
3.12 PCB15 (WK-5606)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Nylon Hose and two terminals of SOL1.
3) Open the Dust sheet. Remove the eight screws. Remove the two PCB supporters and remove the PCB15 (WK-5606).

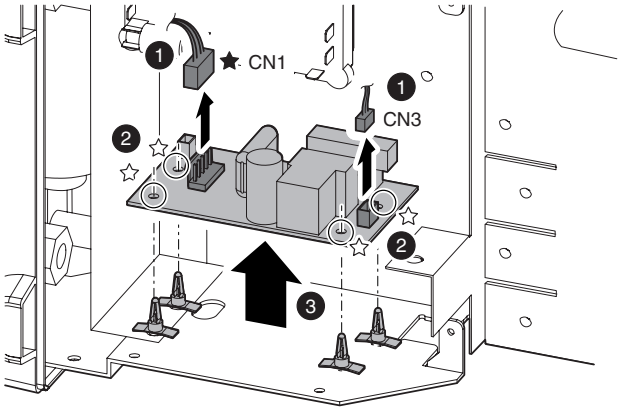


3.13 PCB20 (WK-5499)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove one screw and one terminal. Remove one bolt, toothed washer, washer and terminal. Remove one screw, nut and the Output Bus Bar. Disconnect one connector from HCT1.

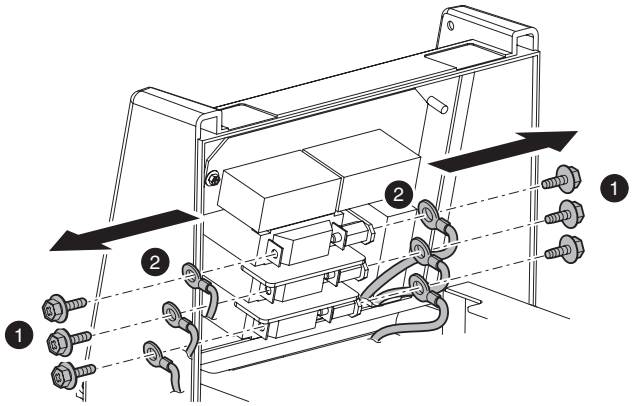


3) Disconnect the two connectors.
Remove the four PCB board supporters and then remove the PCB20 (WK-5499).

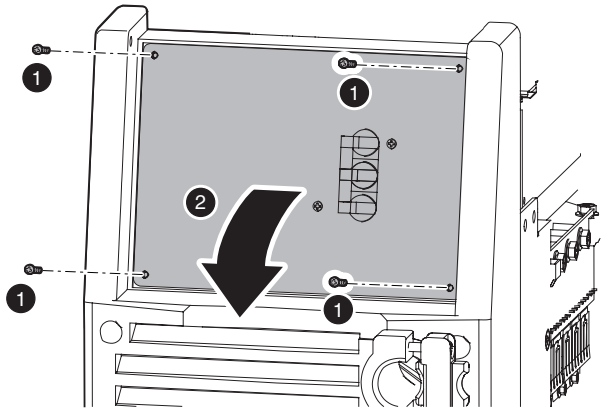


3.14 PCB21 (WK-4917)

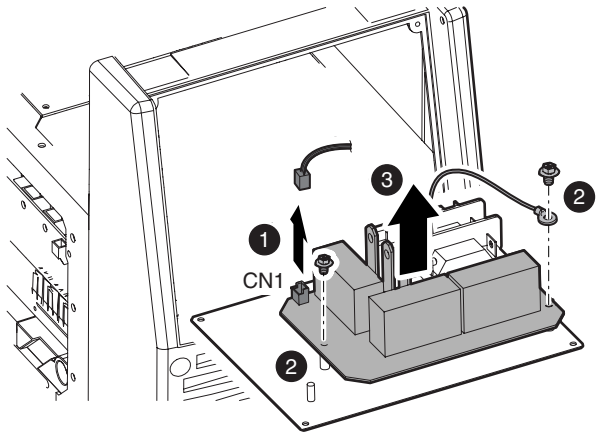
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the six screws from the S1 and remove the six terminals.



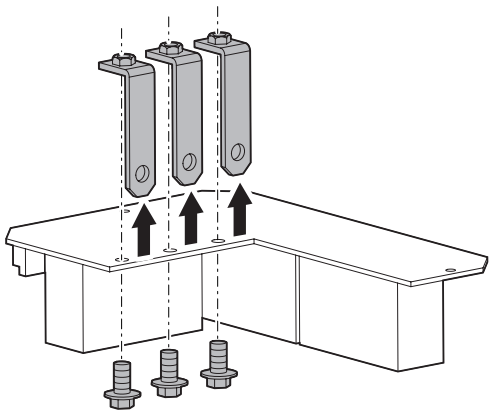
3) Remove the four screws and then open the Rear Board.



4) Disconnect the one connector. Remove the two screws and one ground terminal. Remove the PCB21 (WK-4917).

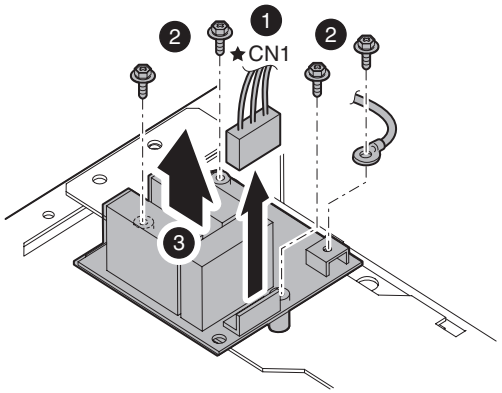


5) Remove the three screws and the S1 Bus Bar from the PCB21 (WK-4917).

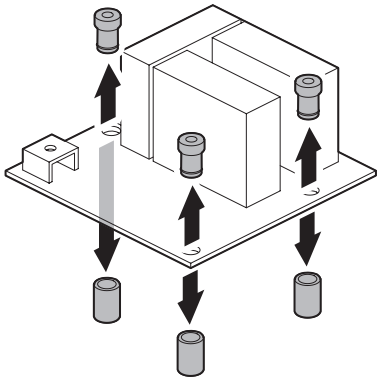


3.15 PCB22 (WK-5022)

1) Remove the Side Panel. [Reference page : 11-1]
2) Disconnect one connector.
   Remove the four screws and one terminal. Remove the PCB22 (WK-5022).

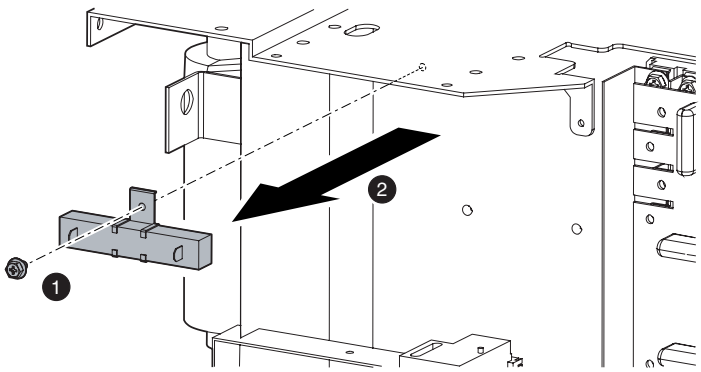


3) Remove three board supports.



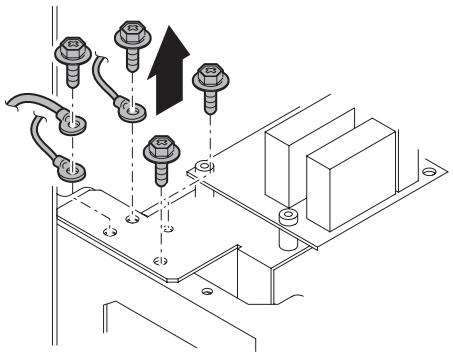
3.16 Current Limiting Resistor (R6)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the HF.UNIT1 [Reference page : 11-15]
3) Cut the cable. Remove one screw and then remove the Current Limiting Resistor (R6).

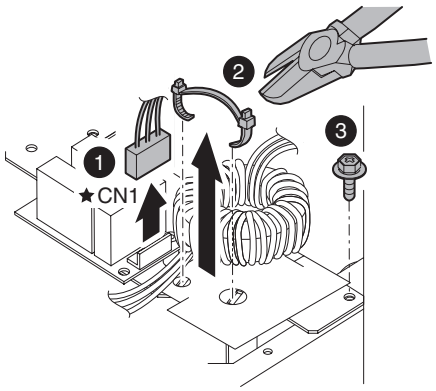


3.17 Resistor (R7, R8)

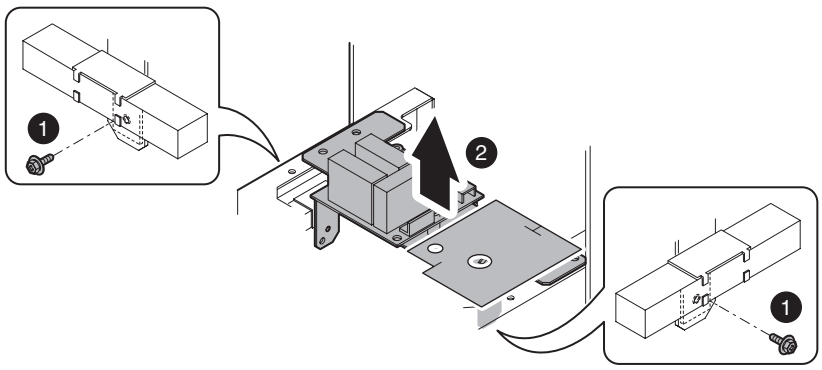
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove four screws and three terminals.



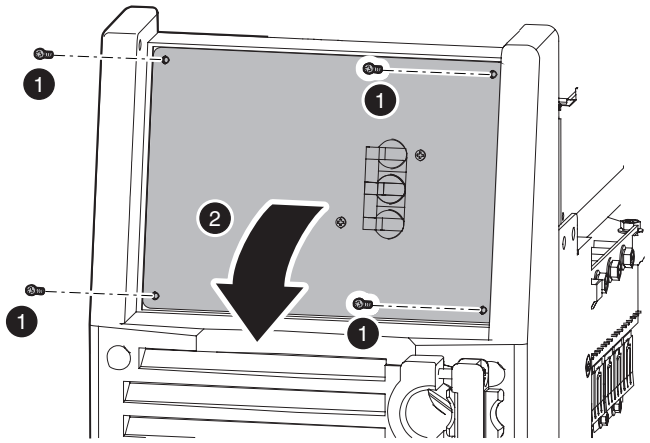
3) Cut off one snap band and disconnect one connector. Remove the one screw.



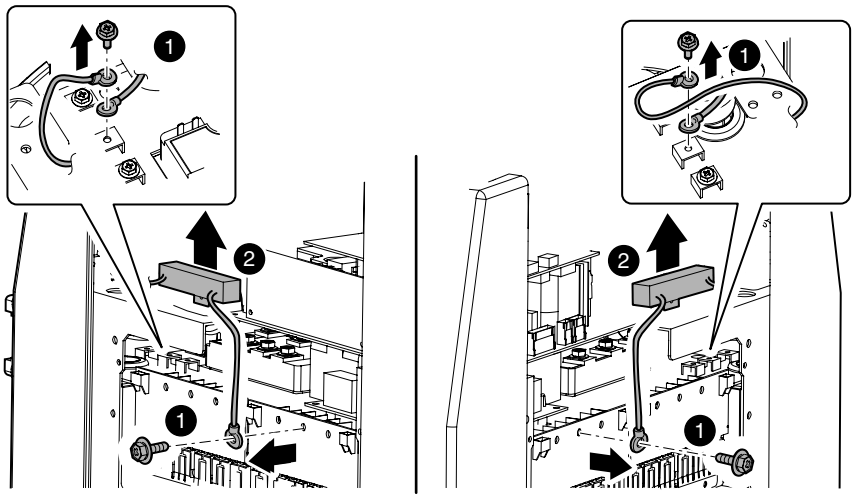
4) Remove two screws and remove the PCB22 unit.



5) Remove four screws and open the Rear Panel.

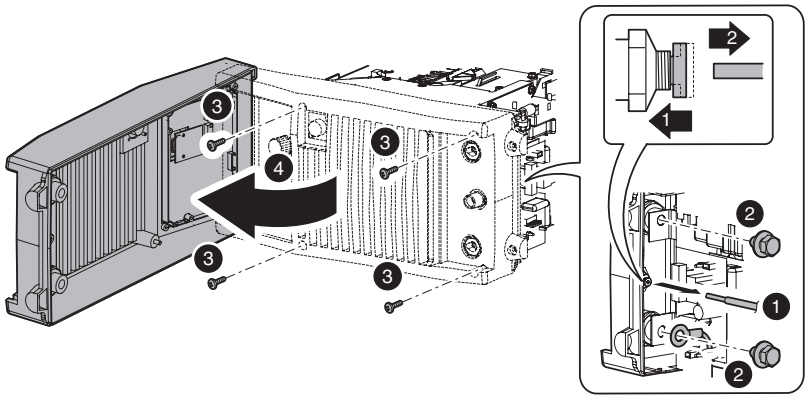


6) Remove four screws and six terminals. Remove the Resistors (R7 and R8).

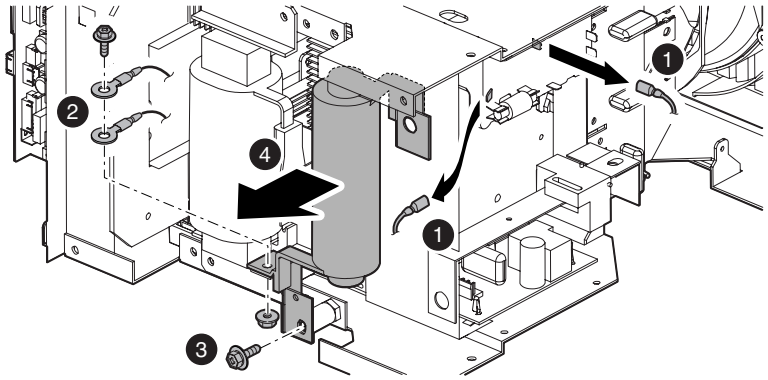


3.18 Coupling Coil (CC1) ⭘⊕ ∗300/400TS only

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Nylon Hose. Remove the two bolts, and one terminal.
   Remove the four screws and open the Front Panel.

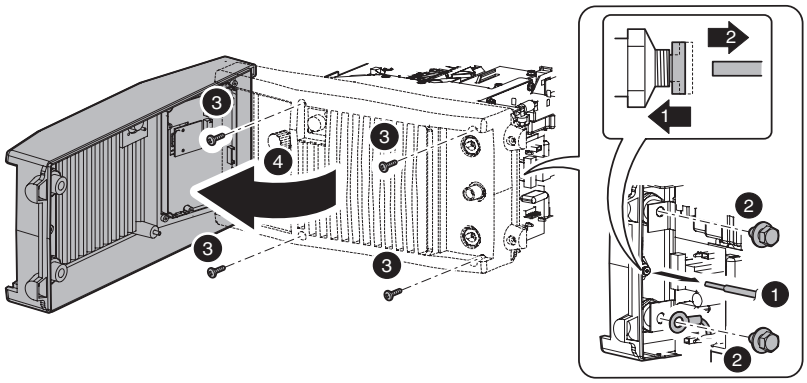


3) Remove the two terminals. Remove one screw, one nut and two terminals.
   Remove one screw and detach the Coupling Coil (CC1).

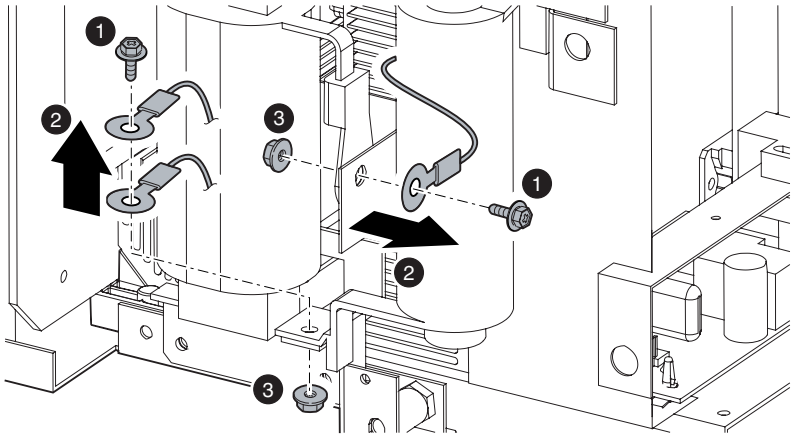


3.19 Reactor (FCH1) ⭘⊕

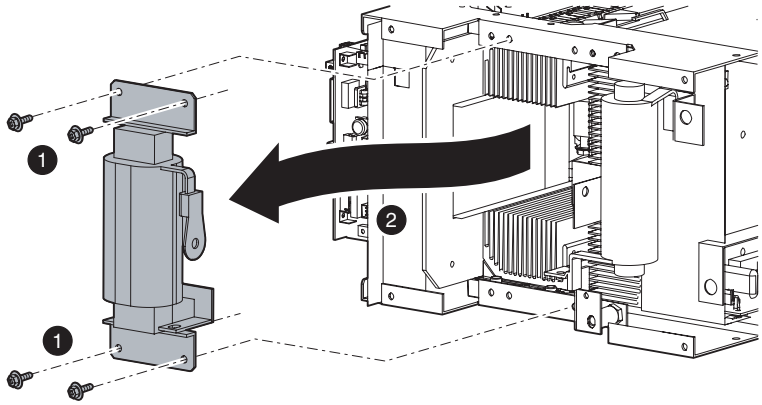
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Nylon Hose. Remove the two bolts, and one terminal.
   Remove the four screws and open the Front Panel.



3) Remove one screw, one nut and two terminals. Remove one screw, one nut and one terminal.

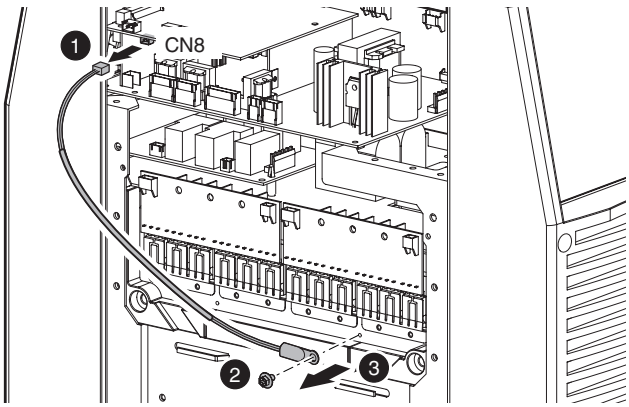


4) Remove four screws and remove the Reactor (FCH1).



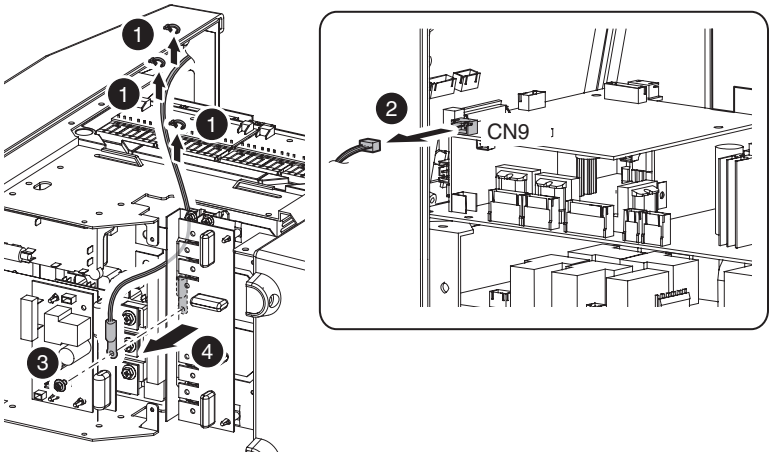
3.20 Primary Thermistor (TH1)

1) Remove the Side Panel. [Reference page : 11-1]
2) Disconnect the one connector CN8 on the PCB6. Remove the one screw and then detach the Primary Thermistor (TH1).
   - Before installing a new therminstor, apply a uniform coat of silicone compound (Shinetsu Silicone G-747 or equivalent) on the base.



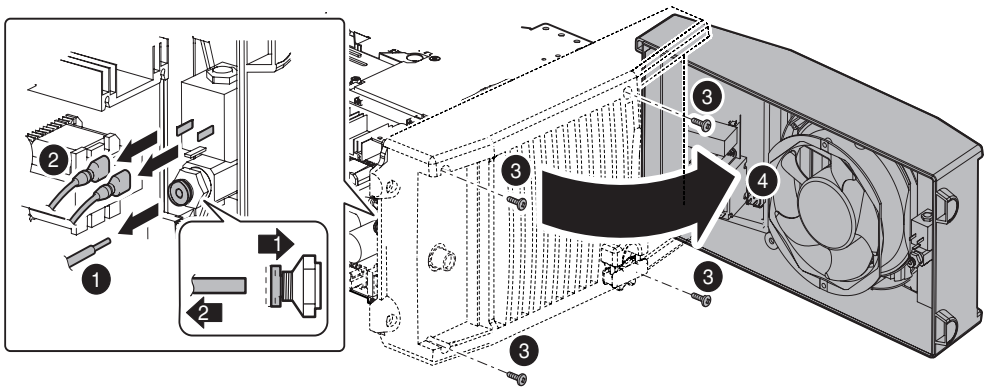
3.21 Secondary Thermistor (TH2)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB16 (WK-5569). [Reference page : 12-16]
3) Cut the three snap bands and disconnect the one connector CN9 on the PCB6. Remove the one screw and Secondary Thermister (TH2).
   - Before installing a new therminstor, apply a uniform coat of silicone compound (Shinetsu Silicone G-747 or equivalent) on the base.

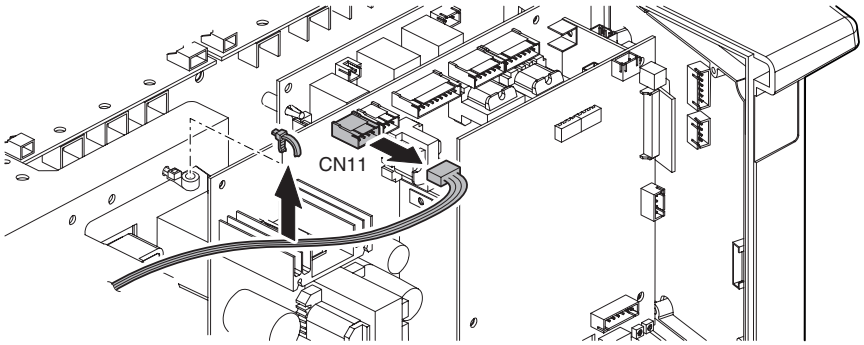


3.22 Cooling Fan (FAN1)

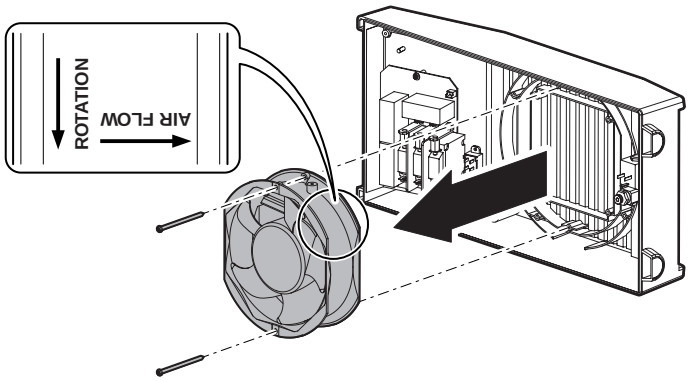
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Nylon Hose and two terminals. Remove the four screws and open the Rear Panel.



3) Cut the one snap band and disconnect the one connector CN11 on the PCB3.

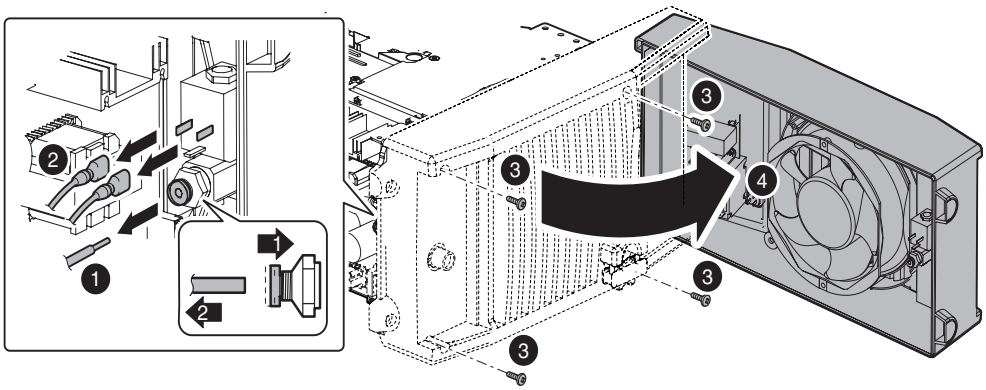


4) Remove the two screws and detach the Cooling Fan (FAN1).
   • Do not have the wrong direction of the fan when reinstalling.

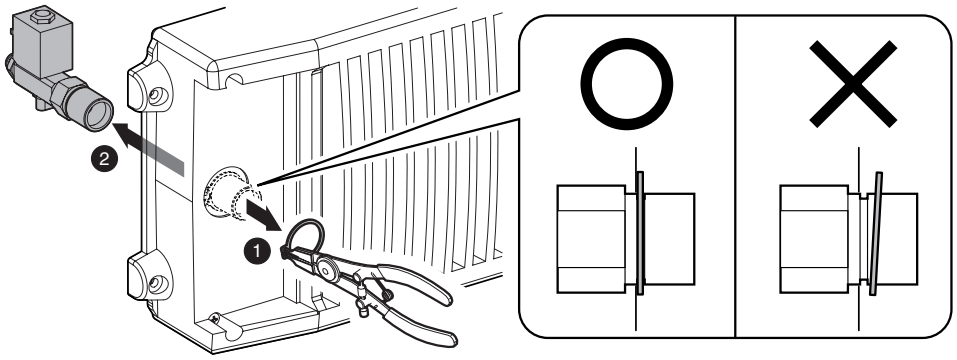


3.23 Solenoid Valve (SOL1) ⊕◯ ∗300/400TS only

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Nylon Hose and two terminals. Remove the four screws and open the Rear Panel.

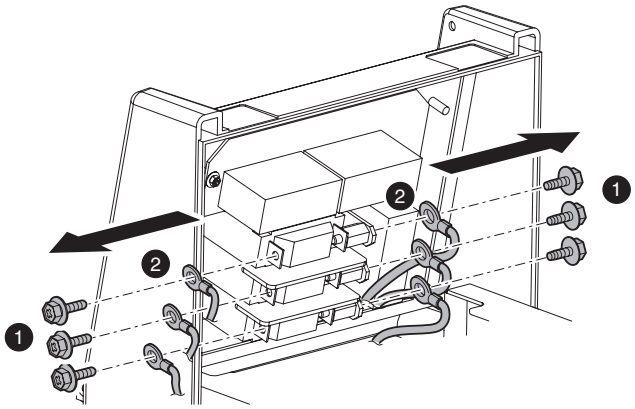


3) Remove the C-ring and detach the Solenoid Valve (SOL1).
   • When reinstalling, make sure that the C-ring seats in the Solenoid Valve groove.

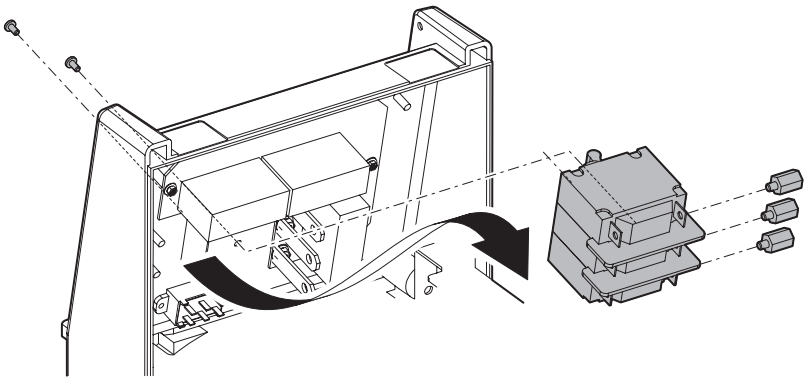


3.24 Main ON/OFF Switch (S1)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the six screws and six terminals.

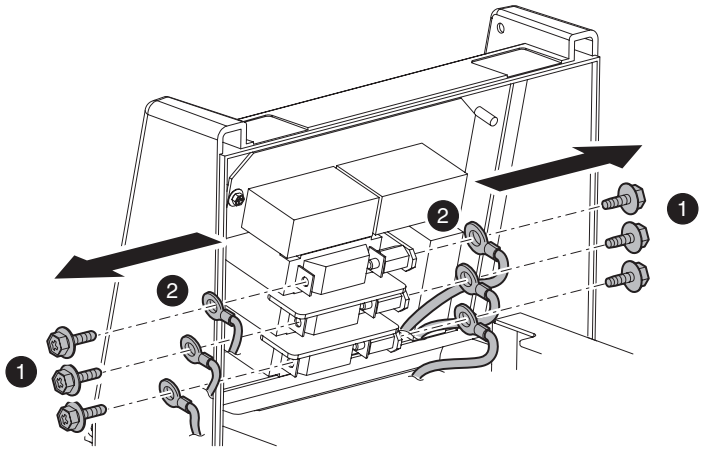


3) Remove the two screws and detach the Main ON/OFF Switch (S1). Remove the three posts.

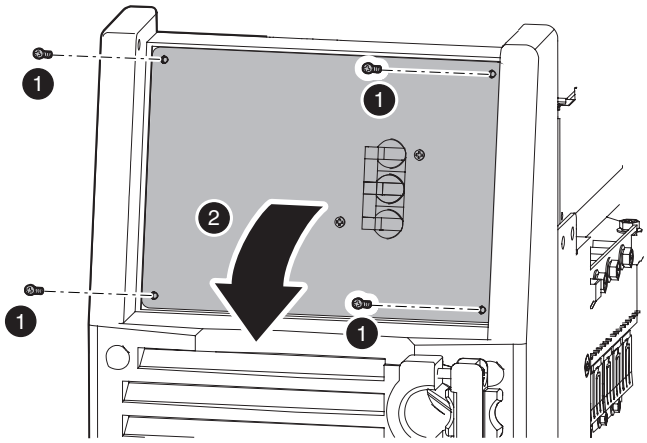


3.25 Input Voltage Switch (S2)

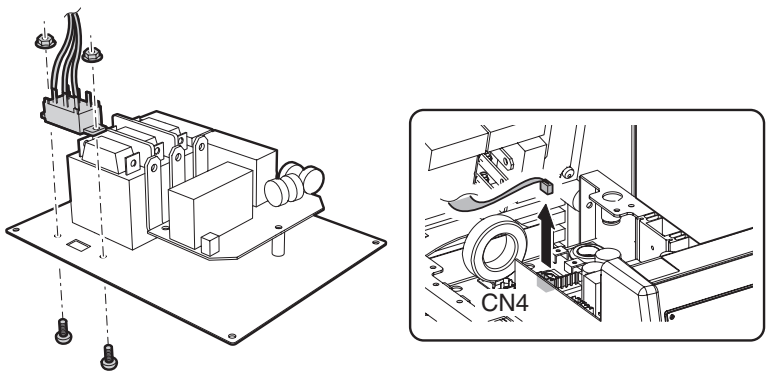
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the six screws and six terminals.



3) Remove the four screws, and open the Rear Board.

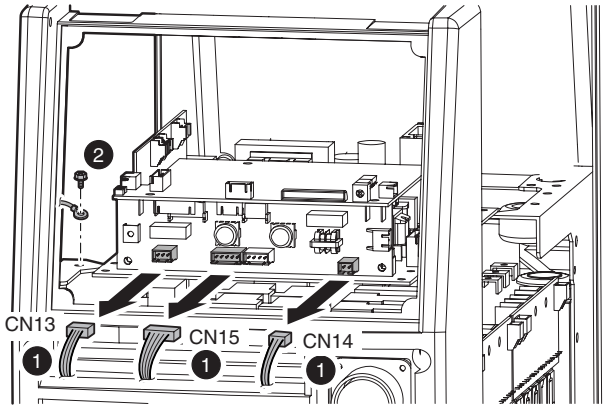


4) Disconnect the one connector CN4 on the PCB4.
Remove the two screws and two nuts and then remove the Input Voltage Switch (S2).

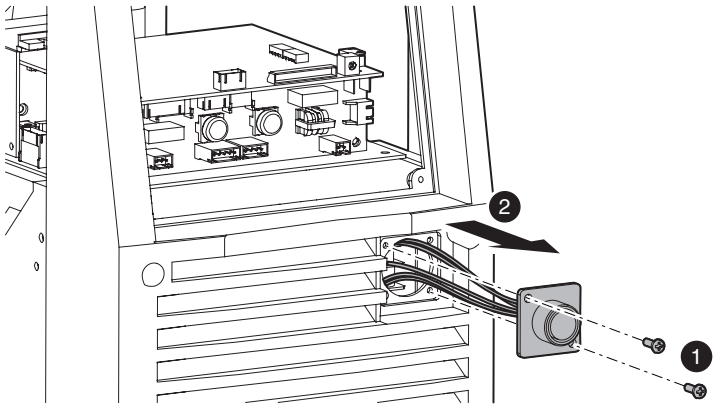


3.26 Remote Socket (CON1) ⊕

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Ring Core (L105). [Reference page : 12-36]
3) Disconnect the three connectors CNB-15 on the PCB7. Remove the one screw and one ground terminals.

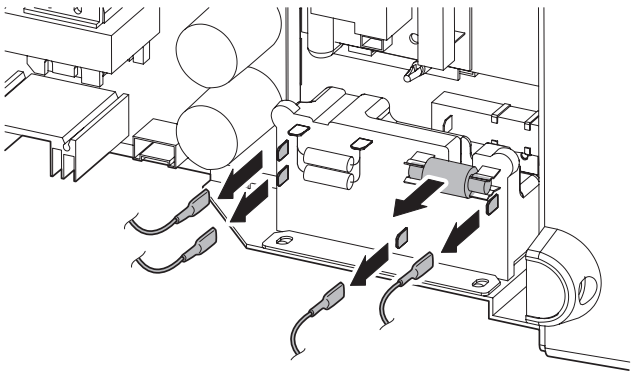


4) Remove the two screws and remove the Remote Socket (CON1).

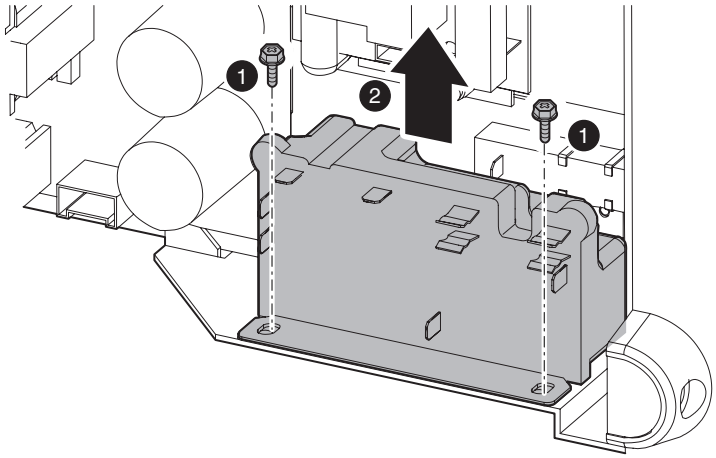


3.27 High Freguency Unit (HF.UNIT1) ⊕ ∗300/400TS only

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the high freguency gap. Remove the four terminals.

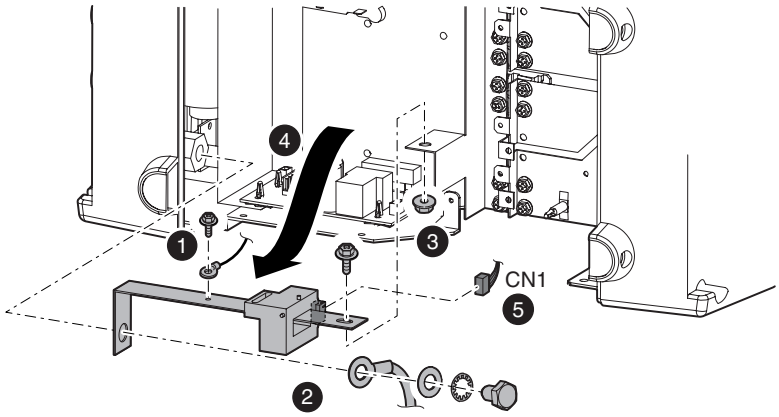


3) Remove the two screws and detach the High Freguency Unit (HF. UNIT1).

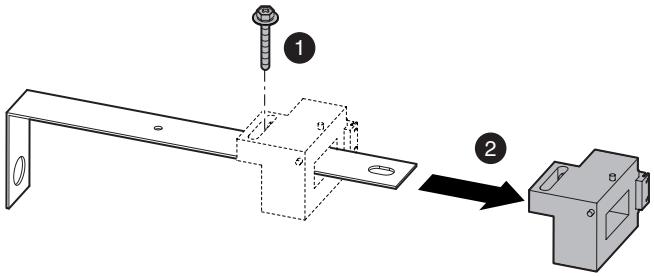


3.28 Hall Current Sensor (HCT1)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove one screw and one terminal. Remove one bolt. toothed washer, washer and terminal. Remove one screw. nut and the Output Bus Bar. Disconnect one connector from HCT1.

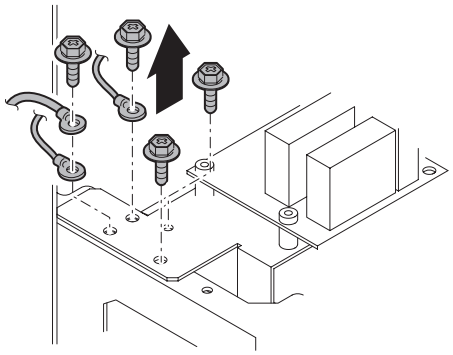


3) Remove the one screw and detach the Hall Current Sensor (HCT1) from the Output Bus Bar.

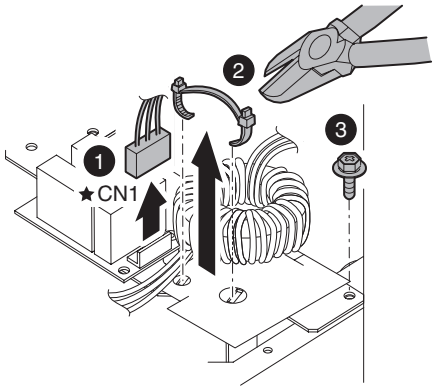


3.29 Primary Diode (D1)

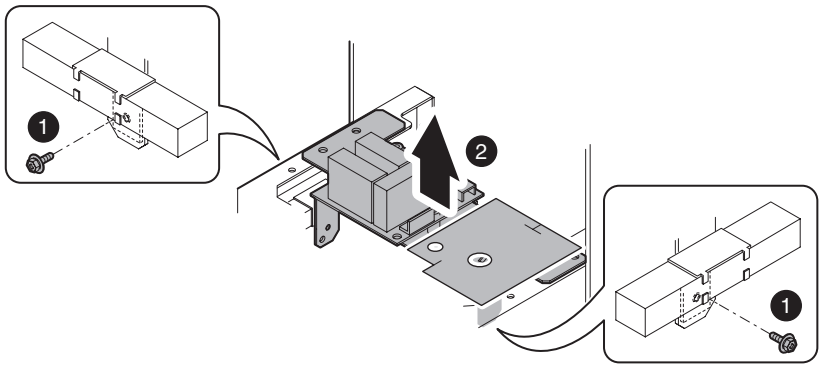
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB3 (WK-5548). [Reference page : 12-9]
3) Remove four screws and three terminals.



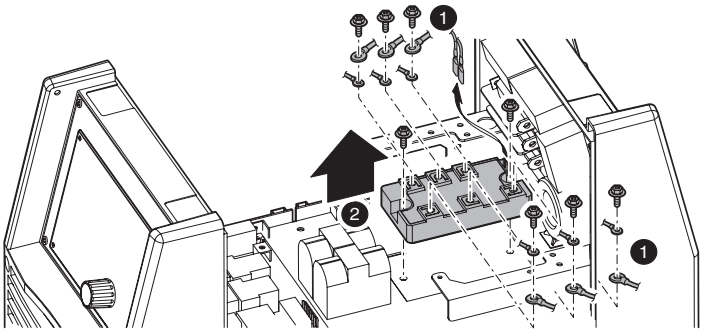
4) Cut off one snap band and disconnect one connector. Remove the one screw.



5) Remove two screws and remove the PCB22 unit.

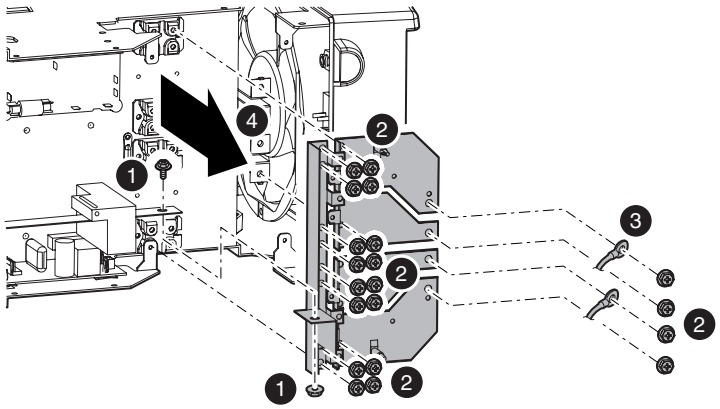


6) Remove the six screws and 14 terminals. Remove the two screws and then detach the Primary Diode (D1).
   - Before installing a new diode, apply a uniform coat of silicone compound (Shinetsu Silicone G-747 or equivalent) on the base.

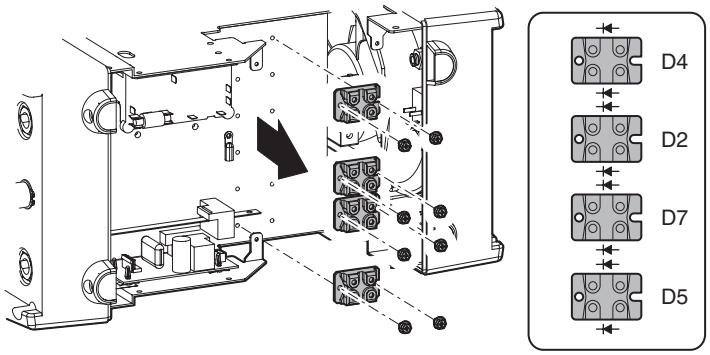


3.30 Secondary Diode (D2, D4, D5 and D7)

1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the PCB15 (WK-5606). [Reference page : 12-17]
3) Remove one screw and one nut. Remove 20 screws and two terminals. Remove the D Bus Bar, D Bus Bar1, D Bus Bar2, D Bus Bar3 and D Bus Bar4.

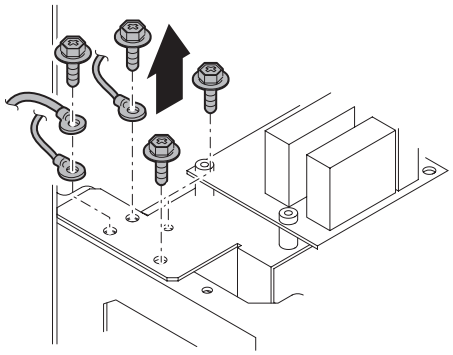


4) Remove the eight screws and then detach the Secondary Diodes (D2, D4, D5, D7).
   - Do not have the wrong direction of the diodes when reinstalling.
   - Before installing a new diodes, apply a uniform coat of silicone compound (Shinetsu Silicone G-747 or equivalent) on the base.

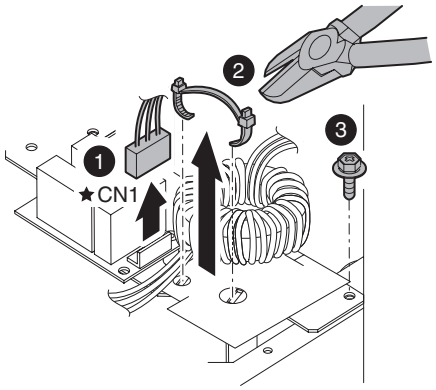


3.31 Current Trans (CT2, CT3)

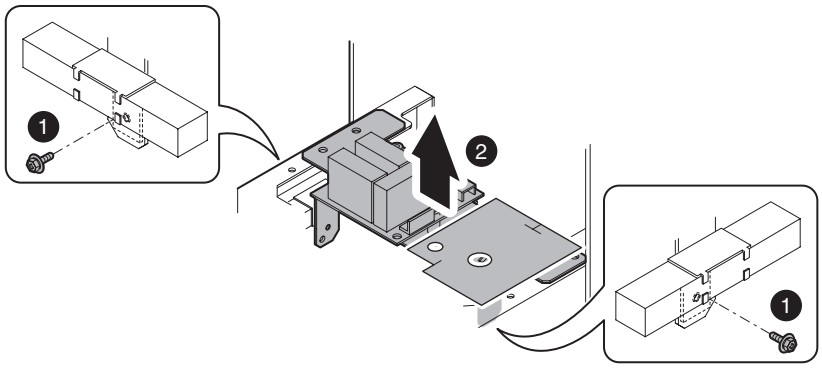
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove four screws and three terminals.



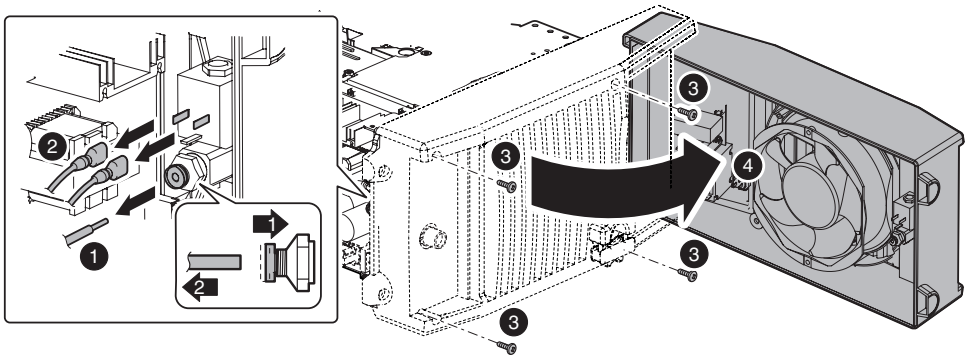
3) Cut off one snap band and disconnect one connector. Remove the one screw.



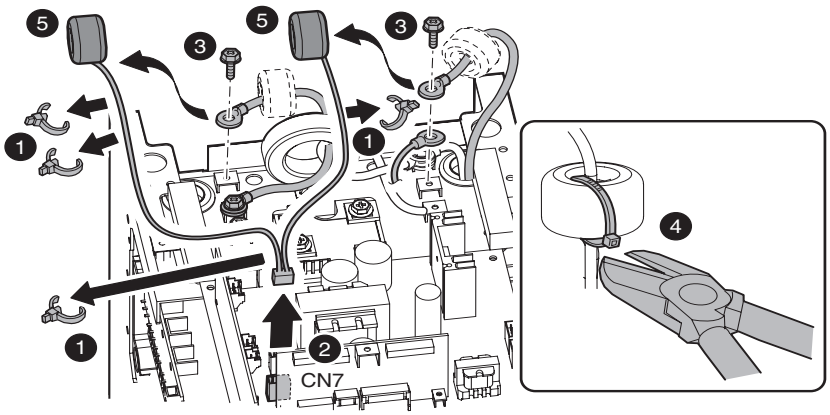
4) Remove two screws and remove the PCB22 unit.



5) Remove the Nylon Hose and two terminals. Remove the four screws and open the Rear Panel.

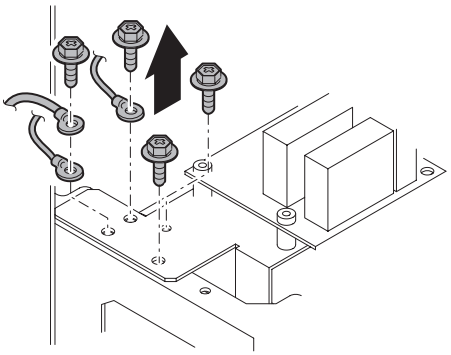


6) Cut the three snap bands and remove the connector from the PCB3 (WK-5548). Remove two screws and three terminals from the PCB1 (WK-5493). Cut two snap bands and remove the Current Trans (CT2, CT3).

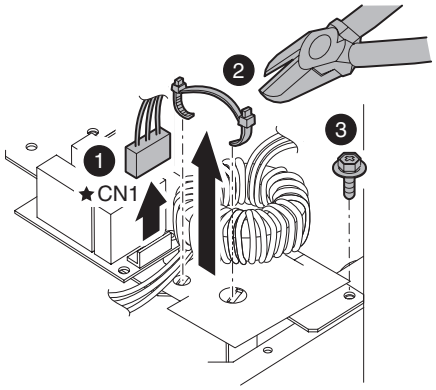


3.32 Ring Core (L1)

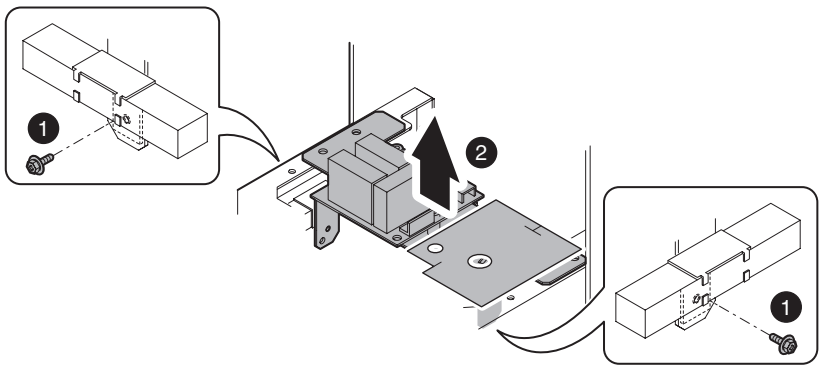
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove four screws and three terminals.



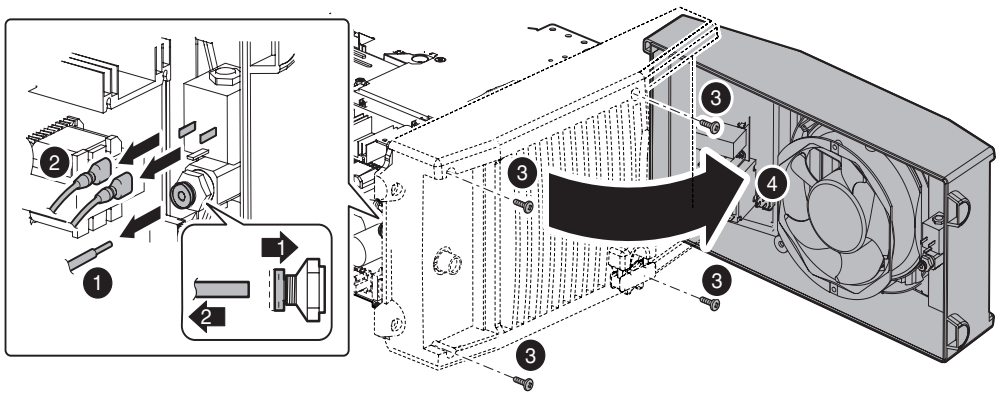
3) Cut off one snap band and disconnect one connector. Remove the one screw.



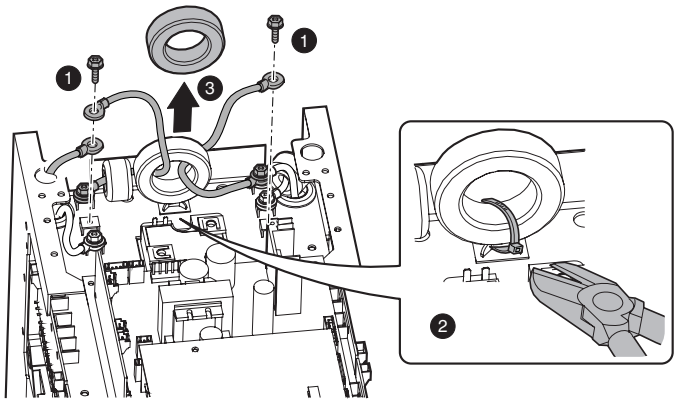
4) Remove two screws and remove the PCB22 unit.



5) Remove the Nylon Hose and two terminals. Remove the four screws and open the Rear Panel.

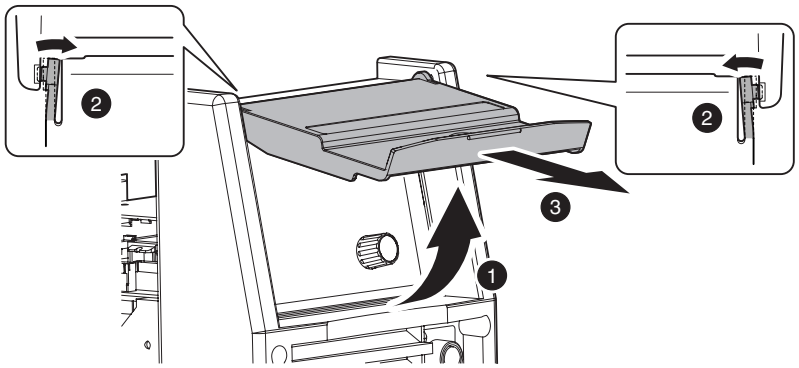


6) Remove the two screws and three terminals. Cut the snap band and remove the Ring Core (L1).

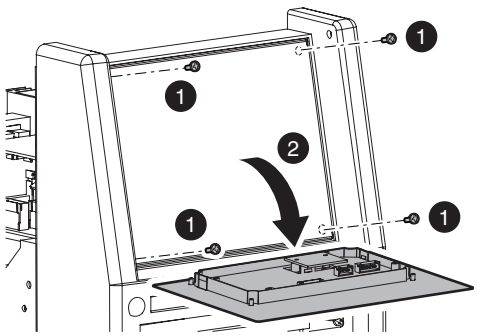


3.33 Ring Core (L105)

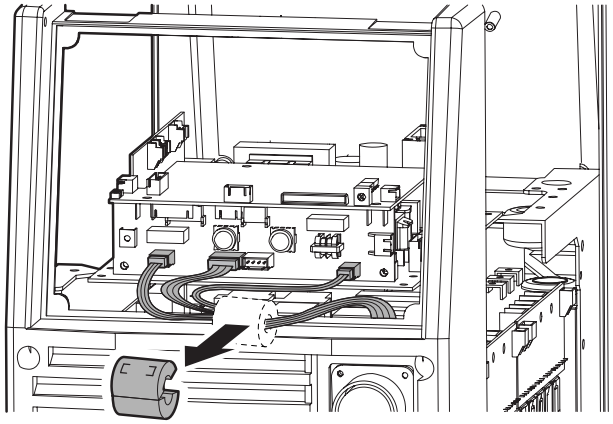
1) Remove the Side Panel. [Reference page : 11-1]
2) Remove the Protection Cover.



3) Remove the four screws. Pull out the Operation Panel and bring it down.

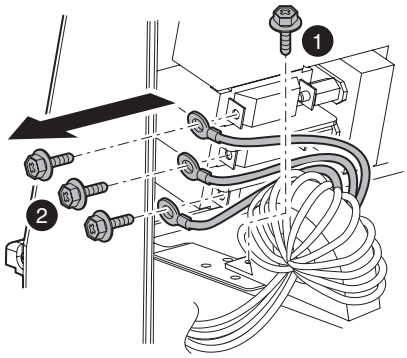


4) Cut the snap band remove the Ring Core (L105).

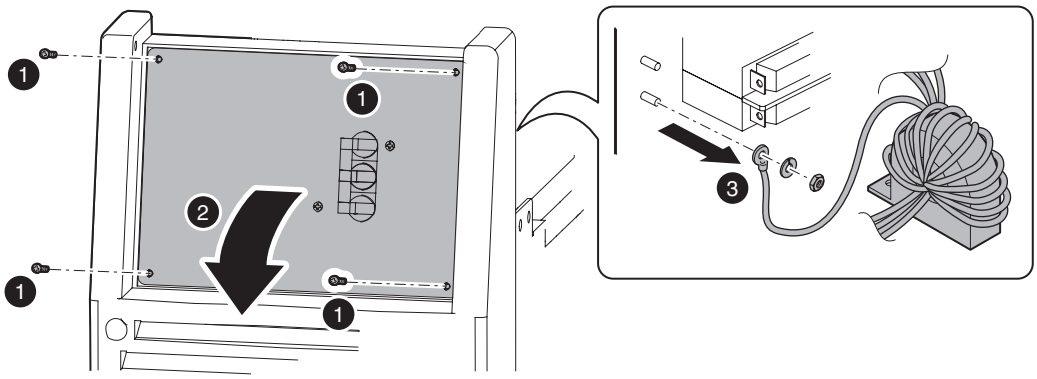


3.34 Reactor (L101)

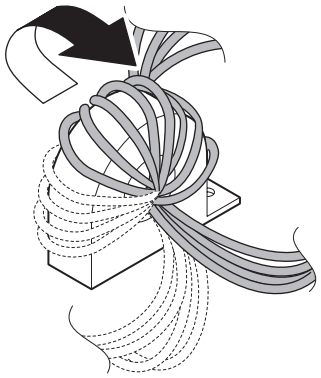
1) Remove the Side Panel. [Reference page: 9-1]
2) Remove four screws and three terminals.



3) Remove four screws and open the rear panel. Remove one nut, one washer and one terminal. Remove the Reactor (L101).

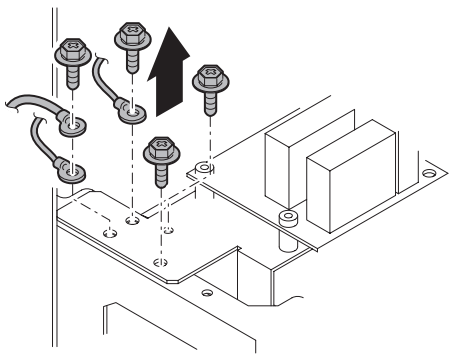


4) Remove harness from the Reactor (L101).
   • The harness is rolled three times at the installation.

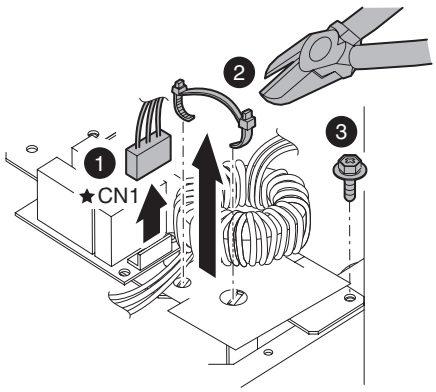


3.35 Reactor (L102)

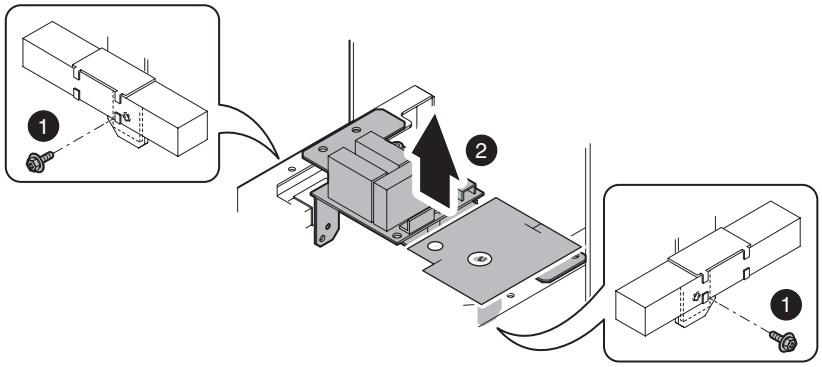
1) Remove the Side Panel. [Reference page: 9-1]
2) Remove four screws and three terminals.



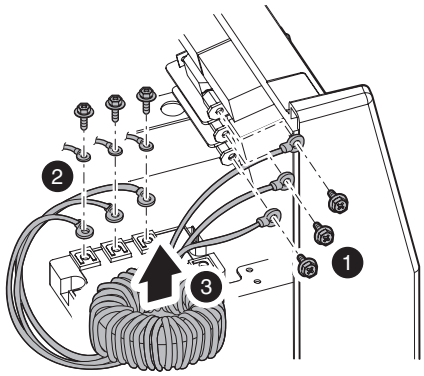
3) Cut off one snap band and disconnect one connector. Remove the one screw.



4) Remove two screws and remove the PCB22 unit.

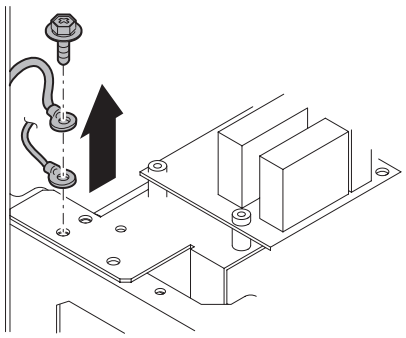


5) Remove six screws, nine terminals and remove the Reactor (L102).

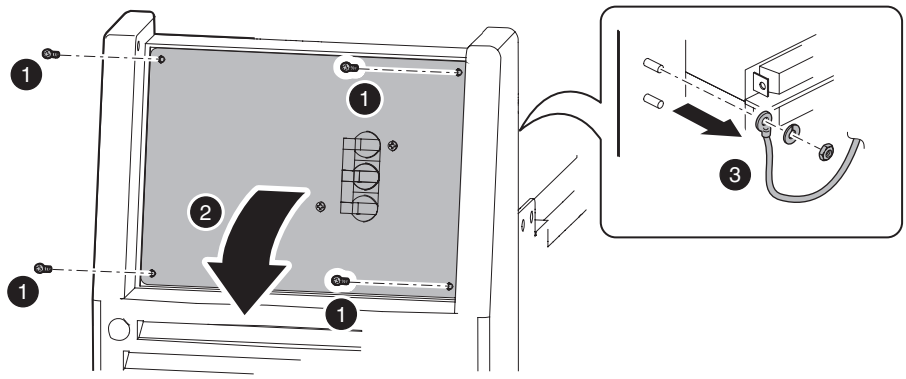


3.36 Reactor (L103)

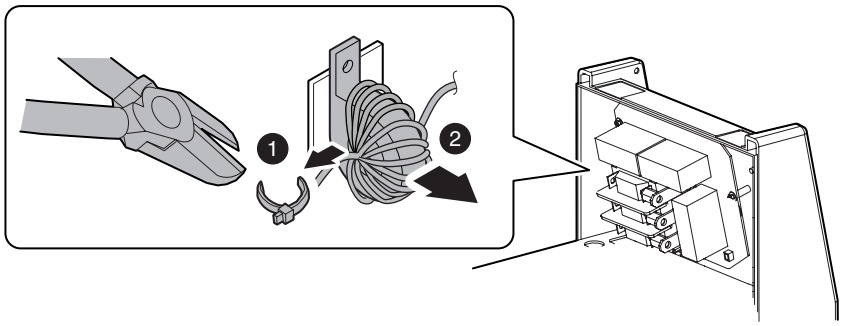
1) Remove the Side Panel. [Reference page: 9-1]
2) Remove one screw and two terminals.



3) Remove four screws and open the rear panel. Remove one nut, one washer and one terminal.



4) Cut off one snap band. Remove the Reactor (L103).



APPENDIX 1 PARTS LIST

1 Equipment Identification

All identification numbers as described in the Introduction chapter must be furnished when ordering parts or making inquiries. This information is usually found on the nameplate attached to the equipment. Be sure to include any dash numbers following the Part or Assembly numbers.

2 How To Use This Parts List

The Parts List is a combination of an illustration and a corresponding list of parts which contains a breakdown of the equipment into assemblies, subassemblies, and detail parts. All parts of the equipment are listed except for commercially available hardware, bulk items such as wire, cable, sleeving, tubing, etc., and permanently attached items which are soldered, riveted, or welded to other parts. The part descriptions may be indented to show part relationships. To determine the part number, description, quantity, or application of an item, simply locate the item in question from the illustration and refer to that item number in the corresponding Parts List.

PART NUMBERS:

ARC MASTER 300TS 10-3097 ARC MASTER 400TS 10-3091

ARC MASTER 300S 10-3094 ARC MASTER 400S 10-3095

300/400TS

No.	DWG No.	Part No.	Description	Additional Information	QTY.
1	CC1	W7001382	Coupling Coil, gen 3.1, IPS	F3A073800 300A AC CC	1
2	CON1	W7001666	Connector, remote, gen 3.1, IPS	MS3102A20-27S (NIC) 14P (with Wiring Assembly)	1
3	CT2-3	W7001304	Transformer, gen 3.1, IPS	F2A503001 CT 1:40	2
4	D1	10-6628	Diode, gen 3.1, IPS	DFA50BA160	1
5	D2,4,5,7	10-6629	Diode, gen 3.1, IPS	DBA200UA60	4
6	FAN1	W7001307	Fan, gen 3.1, IPS	109E5724H507 DC 24V 16.8W	1
7	FCH1	W7001687	Inductor, gen 3.1, IPS	F3A285700 DC TIG FCH	1
8	HCT1	10-5003	Sensor, Current, gen 3.1, IPS	HC-TN200V4B15M 200A 4V	1
9	HF.UNIT1	W7001399	HF, Unit, gen 3.1, IPS	HF.UNIT (WK-4840 U04)	1
10		10-6633	HF, Gap, gen 3.1, IPS	U0A601100	1
11	L1	W7001309	Reactor, gen 3.1, IPS	GP-7	1
12	L101	W7001670	Reactor, gen 3.1, IPS	DFR47ZMD	1
13	L102	W7001672	Reactor, gen 3.1, IPS	F2A734000	1
14	L103	W7001605	Reactor, gen 3.1, IPS	SNG-25B-600	1
15	L105	W7001400	Reactor, gen 3.1, IPS	ZCAT-3035-1330	1
16	PCB1	W7001312	PCB, gen 3.1, IPS	WK-5493 U01 MAIN PCB	1
17	PCB2	W7001313	PCB, gen 3.1, IPS	WK-5597 U01 LINK PCB	1
18	PCB3	W7001314	PCB, gen 3.1, IPS	WK-5548 U01 DDC PCB	1
19	PCB4	10-6635	PCB, gen 3.1, IPS	WK-4819 U01 DETECT PCB	1
20	PCB5	W7001417	PCB, gen 3.1, IPS	WK-5551 U01 CONECT PCB	1
21	PCB6	W7001737	PCB, 400TS, gen 3.1, IPS	WK-5549 U05-4 DC CTRL PCB	1
21	PCB6	W7001736	PCB, 300TS, gen 3.1, IPS	WK-5549 U5-3 DC CTRL PCB	1
22	PCB7	W7001423	PCB, gen 3.1, IPS	WK-5550 U01 FILTER PCB	1
23	PCB8-11	W7001318	PCB, gen 3.1, IPS	WK-5479 U01 GATE PCB (with IRGP20B60PD)	4

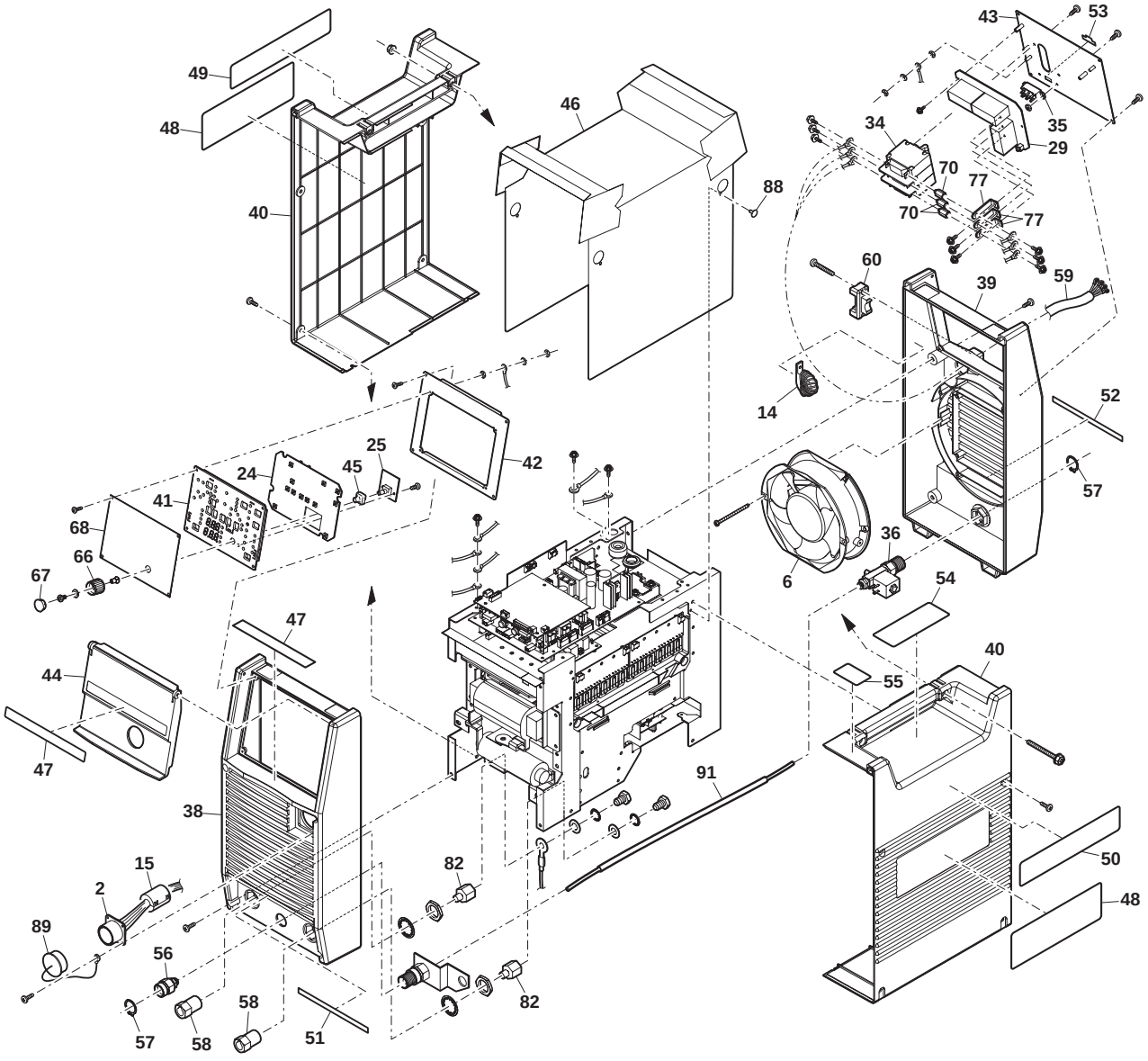
300/400TS

No.	DWG No.	Part No.	Description	Additional Information	QTY.
24	PCB12	W7001811	PCB,WK5527 U09,GEN3.1,IPS	WK-5527 U09 PANEL PCB	1
25	PCB13	W7001320	PCB, gen 3.1, IPS	WK-5528 U01 ENCODER PCB	1
26	PCB14	W7001321	PCB, gen 3.1, IPS	WK-5594 U01 TRANS PCB	1
27	PCB15	W7001322	PCB, gen 3.1, IPS	WK-5606 U01 DIODE SNUBBER PCB	1
28	PCB20	W7001324	PCB, gen 3.1, IPS	WK-5499 U01 FILTER PCB	1
29	PCB21	10-6740	PCB, gen 3.1, IPS	WK-4917 U04 INPUT FILTER PCB	1
30	PCB22	W7001677	PCB, gen 3.1, IPS	WK-5022 B U01 FILTER2_PCB	1
31	R2	W7001449	Resistor, gen 3.1, IPS	ERG3SJ220H 3W 22Ω	2
32	R6	W7001451	Resistor, gen 3.1, IPS	MHS20A101KI 20W 100Ω	1
33	R7-8	W7001325	Resistor, gen 3.1, IPS	MHS20A151JI 20W 150OHM	2
34	S1	10-6857	Switch, gen 3.1, IPS	DCP-103SR100C-480V 3P-480V	1
35	S2	10-5222	Switch, gen 3.1, IPS	SDKGA4-A-1-A	1
36	SOL1	W7001604	Solenoid Valve, gen 3.1, IPS	5505NBR1.5 DC24V 11VA/10W (with Gas Inlet and PC4-02)	1
37	TH1,2	10-5228	Thermistor, gen 3.1, IPS	ERTA53D203 20kΩ/25°CB=3950K	2
38		W7001472	Panel, Front, gen 3.1, IPS	E0D004801	1
39		W7001329	Panel, Rear, gen 3.1, IPS	E0D004901	1
40		W7001330	Label, Side, gen 3.1, IPS	E0D005207	2
41		W7001331	Case, Front, gen 3.1, IPS	E0C346000	1
42		W7001332	Board, Front, gen 3.1, IPS	JEA496001	1
43		W7001656	Cover, Rear, gen 3.1, IPS	JDA173300	1
44		10-6791	Cover, Encoder, gen 3.1, IPS	EBA514400	1
45		W7001336	Cover, PCB, gen 3.1, IPS	E1B547900(with Dustcover Sheet)	1
46			Label, Name, gen 3.1, IPS	N4A933200 (300TS)	1
47		W7001686	Label, Name, gen 3.1, IPS	N4A933300 (400TS)	1
48		W7001338	Label, Side, gen 3.1, IPS	N4A785200	2
49		W7001339	Label, 1 Warning, gen 3.1, IPS	N1B029700	1
50		W7001340	Label, 2 Warning, gen 3.1, IPS	N1B029800	1
51		W7001689	Label, terminal output, gen 3.1,IPS	N4A670700	1
52		10-6733	Label, Gas Input, gen 3.1, IPS	N4A040700	1
53		W7001345	Label, Switch, gen 3.1, IPS	N4A919100	1
54		W7001513	Label, VRD, gen 3.1, IPS	N4A918800	1
55		W7001511	Label, VRD, gen 3.1, IPS	N4A598700	1
56		W7001690	Outlet, Gas, gen 3.1, IPS	E5A925600 (with PC4-02)	1
57		10-5184	C-Ring, gen 3.1, IPS		2
58		10-6660	Terminal, Output, gen 3.1, IPS	TRAK-BE35-70S	2
59		N/A	Cable, Input, gen 3.1, IPS	H07RN-F#1600106 4# X L=3.9m	1
60		10-6795	Clamp, Input, gen 3.1, IPS	EBA156800	1
61		W7001349	Heatsink, gen 3.1, IPS	E1B895000	2
62		W7001350	Heatsink, gen 3.1, IPS	E1B870100	1
63		W7001351	Spring Clip,IGBT, gen 3.1, IPS	E1B850100	8
64		W7001352	Chassis, PCB1, gen 3.1, IPS	J5B017500	1
65		W7001353	Chassis, gen 3.1, IPS	J3C356600	1
66		10-6665	Knob, gen 3.1, IPS	2621603	1
67		10-6666	Knob Cap, gen 3.1, IPS	3021104	1
68		W7001685	Cover, Protector, gen 3.1, IPS	N1B036500 (300TS)	1

300/400TS

No.	DWG No.	Part No.	Description	Additional Information	QTY.
69		W7001357	Sheet, rubber, gen 3.1, IPS	EDA227700	4
70		W7001358	Post, 1(M5), gen 3.1, IPS	EBA643600 (M5-M5)	3
71		W7001645	Bus Bar, D, gen 3.1, IPS	ECA903300	1
72		W7001360	Bus Bar, T-D, gen 3.1, IPS	EDA003800	4
73		W7001361	Bus Bar, 1 D, gen 3.1, IPS	EDA046900	1
74		W7001362	Bus Bar, 2 D, gen 3.1, IPS	EDA047000	1
75		W7001363	Bus Bar, 3 D, gen 3.1, IPS	EDA047100	1
76		W7001364	Bus Bar, 4 D, gen 3.1, IPS	EDA047200	1
77		10-6868	Bus Bar, S1, gen 3.1, IPS	ECA321000	3
78		W7001646	Bus Bar, Output, gen 3.1, IPS	ECA904000	1
79		W7001367	Bus Bar, T-CC, gen 3.1, IPS	EDA047300	1
80		W7001671	Bus Bar, input, gen 3.1, IPS	EDA069200	1
81		W7001673	Chassis, PCB22, gen 3.1, IPS	J5B348000	1
82		W7001368	Post, Output, gen 3.1, IPS	ECA867900	2
83		W7001369	Insulated Board, gen 3.1, IPS	E1B872000	2
84		W7001370	Insulation Sheet, gen 3.1, IPS	E1B859700	1
85		W7001371	Insulation Sheet, gen 3.1, IPS	EDA079800	1
86		W7001643	Cover, Protector, gen 3.1, IPS	E1B933000	1
87		W7001373	Cover, Protector, gen 3.1, IPS	E1B933100	1
88		W7001374	Clip, gen 3.1, IPS	#74 NATURAL	4
89		W7001375	Cover, CON1, gen 3.1, IPS	1070500-20 (with String)	1
90		W7001377	Edge protect, gen 3.1, IPS	EH18U	2
91		10-6681	Hose, Nylon, gen 3.1, IPS	T0425B Nylon Hose L=0.5m	1
92		10-2020	Plug, Output, gen 3.1, IPS	TRAK-SK50	1
		300X4901	Operating Manual, gen 3.1, IPS	Operating Manual (300TS)	1
		300X4902	Operating Manual, gen 3.1, IPS	Operating Manual (400TS)	1
		W7001334	Cover, Protector, gen 3.1, IPS	E0C299200	1

300/400TS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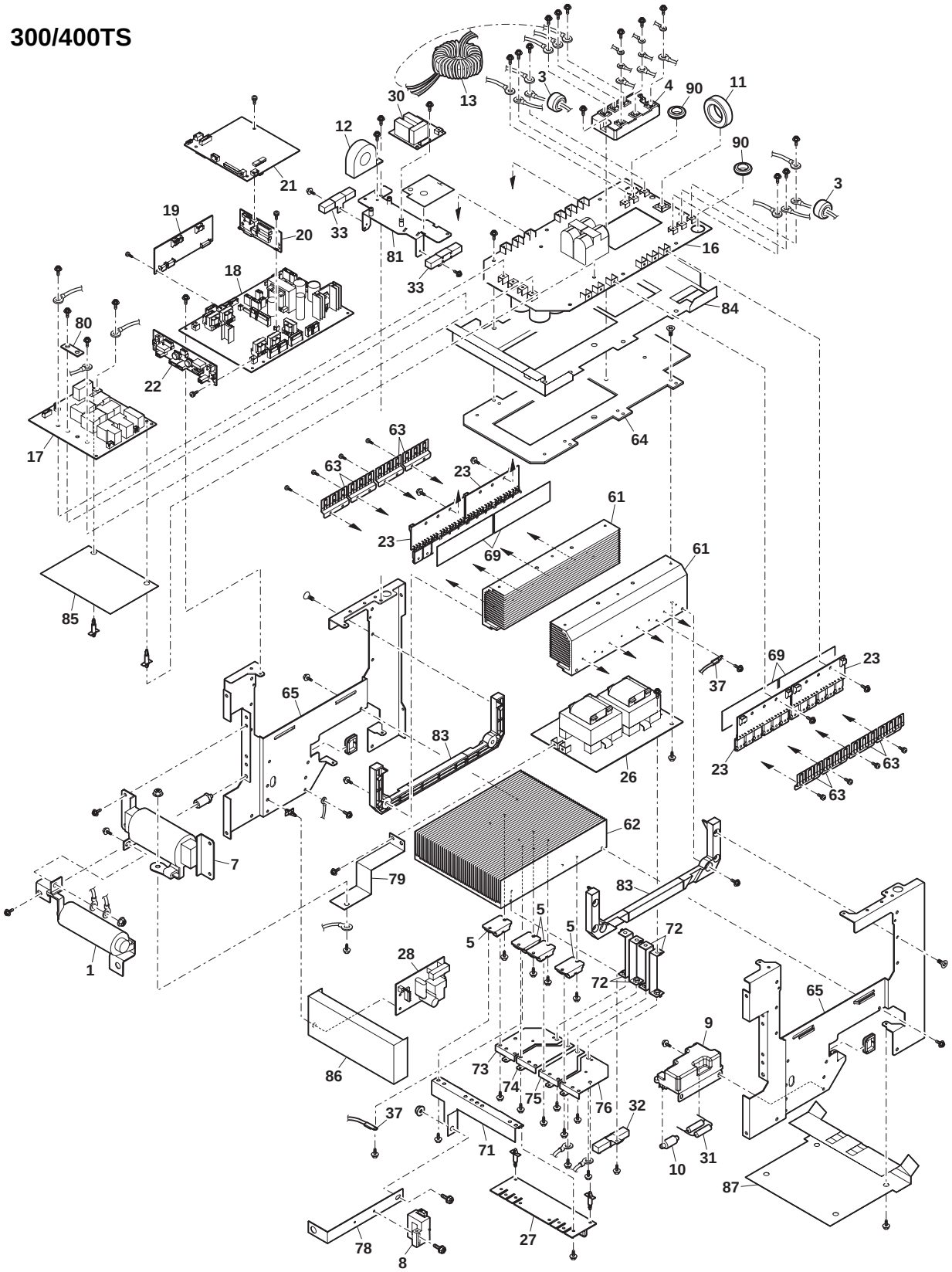
300/400TS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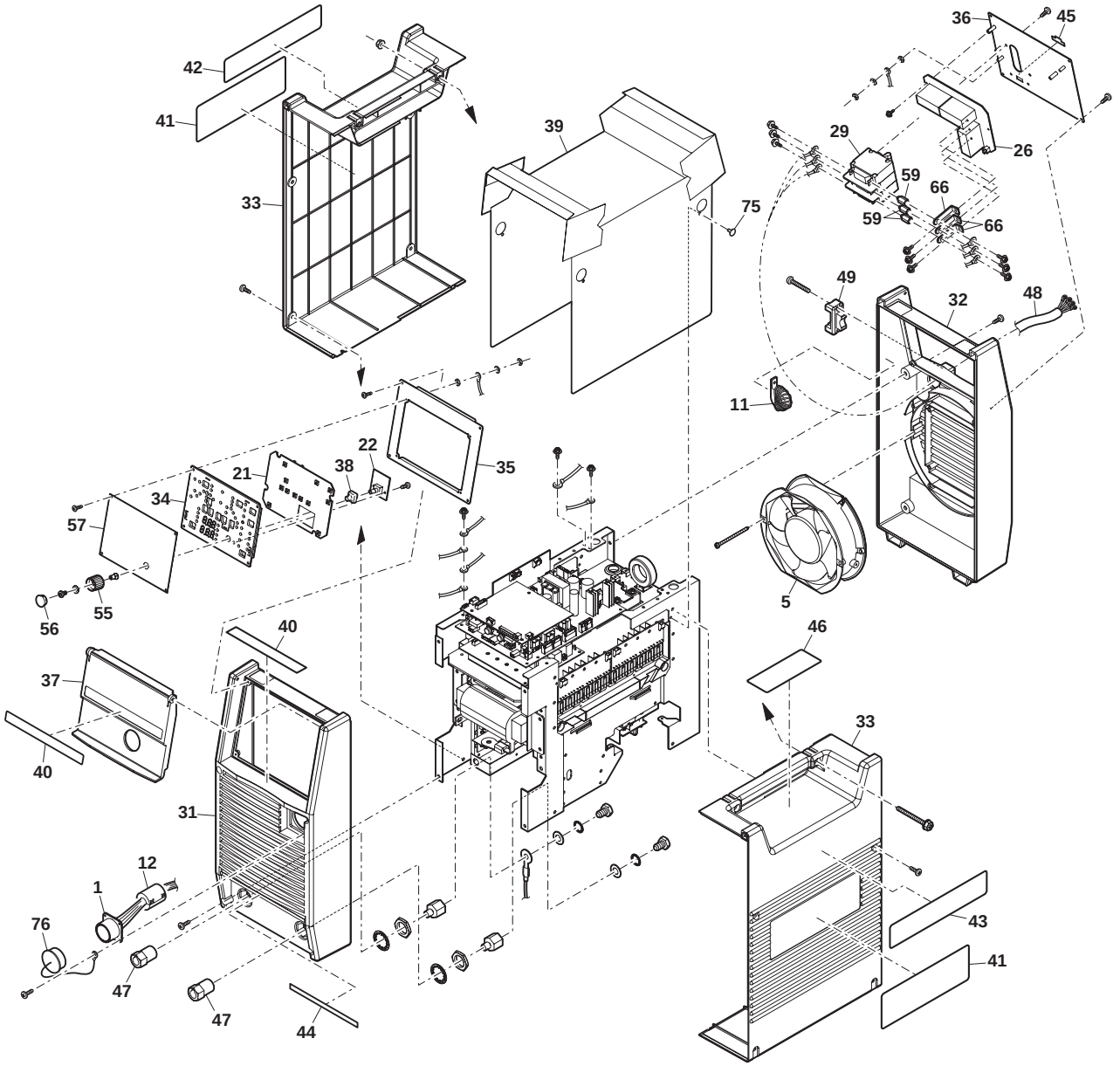
300/400S

No.	DWG No.	Part No.	Description	Additional Information	QTY.
1	CON1	W7001666	Socket, remote, gen 3.1, IPS	MS3102A20-27S(NIC) 14P (with Wiring Assembly)	1
2	CT2-3	W7001304	Transformer, gen 3.1, IPS	F2A503001 CT 1:40	2
3	D1	10-6628	Diode, gen 3.1, IPS	DFA50BA160	1
4	D2,4,5,7	10-6629	Diode, gen 3.1, IPS	DBA200UA60	4
5	FAN1	W7001307	Fan, gen 3.1, IPS	109E5724H507 DC 24V 16.8W	1
6	FCH1	W7001653	Inductor, gen 3.1, IPS	F3A285201 DC FCH	1
7	HCT1	10-5003	Sensor, Current, gen 3.1, IPS	HC-TN200V4B15M 200A 4V	1
8	L1	W7001309	Reactor, gen 3.1, IPS	GP-7	1
9	L101	W7001670	Reactor, gen 3.1, IPS	DFR47ZMD	1
10	L102	W7001672	Reactor, gen 3.1, IPS	F2A734000	1
11	L103	W7001605	Reactor, gen 3.1, IPS	SNG-25B-600	1
12	L105	W7001400	Reactor, gen 3.1, IPS	ZCAT-3035-1330	1
13	PCB1	W7001312	PCB, gen 3.1, IPS	WK-5493 U01 MAIN PCB	1
14	PCB2	W7001678	PCB, gen 3.1, IPS	WK-5597 U02 LINK PCB	1
15	PCB3	W7001314	PCB, gen 3.1, IPS	WK-5548 U01 DDC PCB	1
16	PCB4	10-6635	PCB, gen 3.1, IPS	WK-4819 U01 DETECT PCB	1
17	PCB5	W7001417	PCB, gen 3.1, IPS	WK-5551 U01 CONNECT PCB	1
18	PCB6	W7001733	PCB, 400S, gen 3.1, IPS	WK-5549 U05-2 DC CTRL PCB	1
18	PCB6	W7001732	PCB, 300S, gen 3.1, IPS	WK-5549 U05-1 DC CTRL PCB	1
19	PCB7	W7001423	PCB, gen 3.1, IPS	WK-5550 U01 FILTER PCB	1
20	PCB8-11	W7001318	PCB, gen 3.1, IPS	WK-5479 U01 GATE PCB (with IRGP20B60PD)	4
21	PCB12	W7001813	PCB, WK5527 U14,GEN3.1,IPS	WK-5527 U14 PANEL PCB	1
22	PCB13	W7001320	PCB, gen 3.1, IPS	WK-5528 U01 ENCODER PCB	1
23	PCB14	W7001321	PCB, gen 3.1, IPS	WK-5594 U01 TRANS PCB	1
24	PCB15	W7001322	PCB, gen 3.1, IPS	WK-5606 U01 DIODE SNUBBER PCB	1
25	PCB20	W7001324	PCB, gen 3.1, IPS	WK-5499 U01 FILTER PCB	1
26	PCB21	10-6740	PCB, gen 3.1, IPS	WK-4917 U04 INPUT FILTER PCB	1
27	PCB22	W7001677	PCB, gen 3.1, IPS	WK-5022 U01 INPUT FILTER PCB	1
28	R7-8	W7001325	Resistor, gen 3.1, IPS	MHS20A151JI 20W 150OHM	2
29	S1	10-6857	Switch, gen 3.1, IPS	DCP-103SR100C-480V 3P-480V	1
30	TH1,2	10-5228	Thermistor, gen 3.1, IPS	ERTA53D203 20kΩ/25°CB=3950K	2
31		W7001472	Panel, Front, gen 3.1, IPS	E0D004801	1
32		W7001329	Panel, Rear, gen 3.1, IPS	E0D004901	1
33		W7001330	Label, Side, gen 3.1, IPS	E0D005207	2
34		W7001331	Case, Front, gen 3.1, IPS	E0C346000	1
35		W7001332	Board, Front, gen 3.1, IPS	JEA496001	1
36		W7001656	Cover, Rear, gen 3.1, IPS	JDA173300	1
37		W7001334	Cover, Protector, gen 3.1, IPS	E0C299200	1
38		10-6791	Cover, Encoder, gen 3.1, IPS	EBA514400	1
39		W7001336	Cover, PCB, gen 3.1, IPS	E1B547900 (with Dustcover Sheet)	1
40		W7001676	Label, Name, gen 3.1, IPS	N4A933000 (300S)	1
41		W7001663	Label, Name, gen 3.1, IPS	N4A933100 (400S)	1
42		W7001338	Label, Side, gen 3.1, IPS	N4A785200	2

300/400S

No.	DWG No.	Part No.	Description	Additional Information	QTY.
43		W7001339	Label, 1 Warning, gen 3.1, IPS	N1B029700	1
44		W7001340	Label, 2 Warning, gen 3.1, IPS	N1B029800	1
45		10-6888	Label, Output terminal, gen 3.1, IPS	N4A040400	1
46		W7001342	Label, Switch, gen 3.1, IPS	N4A146500	1
47		10-6660	Terminal, Output (fem), gen 3.1, IPS	TRAK-BE35-70S	2
48		N/A	Cable, Input, gen 3.1, IPS	H07RN-F#1600106 L=3.9m	1
49		10-6795	Clamp, Input, gen 3.1, IPS	EBA156800	1
50		W7001349	Heatsink, gen 3.1, IPS	E1B895000	2
51		W7001350	Heatsink, gen 3.1, IPS	E1B870100	1
52		W7001351	Spring Clip,IGBT, gen 3.1, IPS	E1B850100	8
53		W7001352	Chassis, PCB1, gen 3.1, IPS	J5B017500	1
54		W7001353	Chassis, gen 3.1, IPS	J3C356600	1
55		10-6665	Knob, gen 3.1, IPS	2621603	1
56		10-6666	Knob Cap, gen 3.1, IPS	3021104	1
57		W7001356	Cover, Protector, gen 3.1, IPS	N1B039200	1
58		W7001357	Sheet, rubber, gen 3.1, IPS	EDA227700	4
59		W7001358	Post, 1(M5), gen 3.1, IPS	EBA643600 (M5-M5)	3
60		W7001645	Bus Bar, D, gen 3.1, IPS	ECA903300	1
61		W7001360	Bus Bar, T-D, gen 3.1, IPS	EDA003800	4
62		W7001361	Bus Bar, 1 D, gen 3.1, IPS	EDA046900	1
63		W7001362	Bus Bar, 2 D, gen 3.1, IPS	EDA047000	1
64		W7001363	Bus Bar, 3 D, gen 3.1, IPS	EDA047100	1
65		W7001364	Bus Bar, 4 D, gen 3.1, IPS	EDA047200	1
66		10-6868	Bus Bar, S1, gen 3.1, IPS	ECA321000	3
67		W7001646	Bus Bar, Output, gen 3.1, IPS	ECA904000	1
68		W7001671	Bus Bar, input, gen 3.1, IPS	EDA069200	1
69		W7001673	Chassis, PCB22, gen 3.1, IPS	J5B348000	1
70		W7001369	Insulated Board, gen 3.1, IPS	E1B872000	2
71		W7001370	Insulation Sheet, gen 3.1, IPS	E1B859700	1
72		W7001371	Insulation Sheet, gen 3.1, IPS	EDA079800	1
73		W7001643	Cover, Protector, gen 3.1, IPS	E1B933000	1
74		W7001373	Cover, Protector, gen 3.1, IPS	E1B933100	1
75		W7001374	Clip, gen 3.1, IPS	#74 NATURAL	4
76		W7001375	Cover, CON1, gen 3.1, IPS	1070500-20 (with String)	1
77		W7001377	Edge protect gen 3.1, IPS	EH18U	2
78		10-2020	Plug, Output, gen 3.1, IPS	TRAK-SK50	1
		300x4899	Operating Manual, gen 3.1, IPS	Operating Manual (300S)	1
		300x4900	Operating Manual, gen 3.1, IPS	Operating Manual (400S)	1
		W7001345	Label, VRD, gen 3.1, IPS	N4A919100	1

300/400S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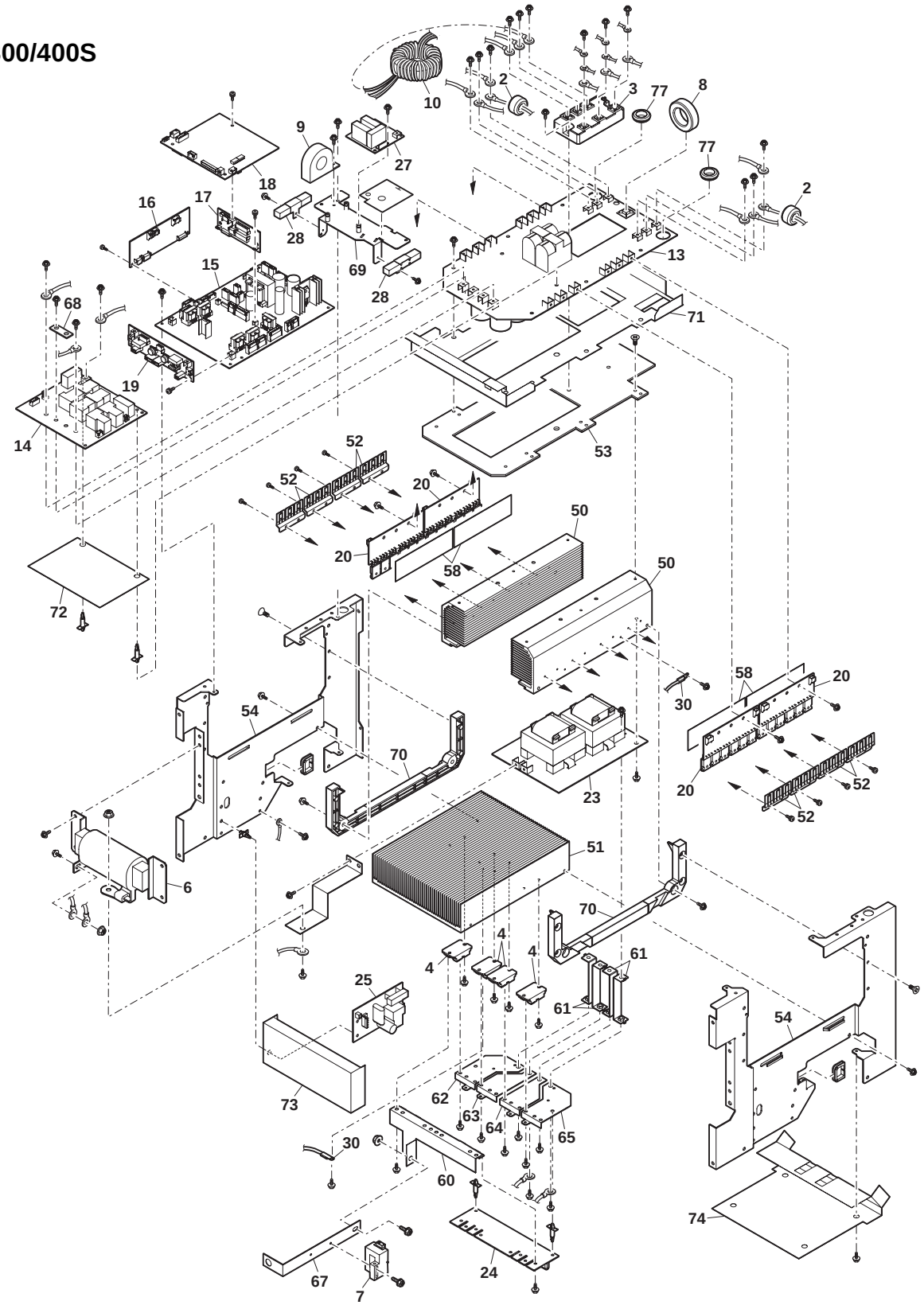
300/400S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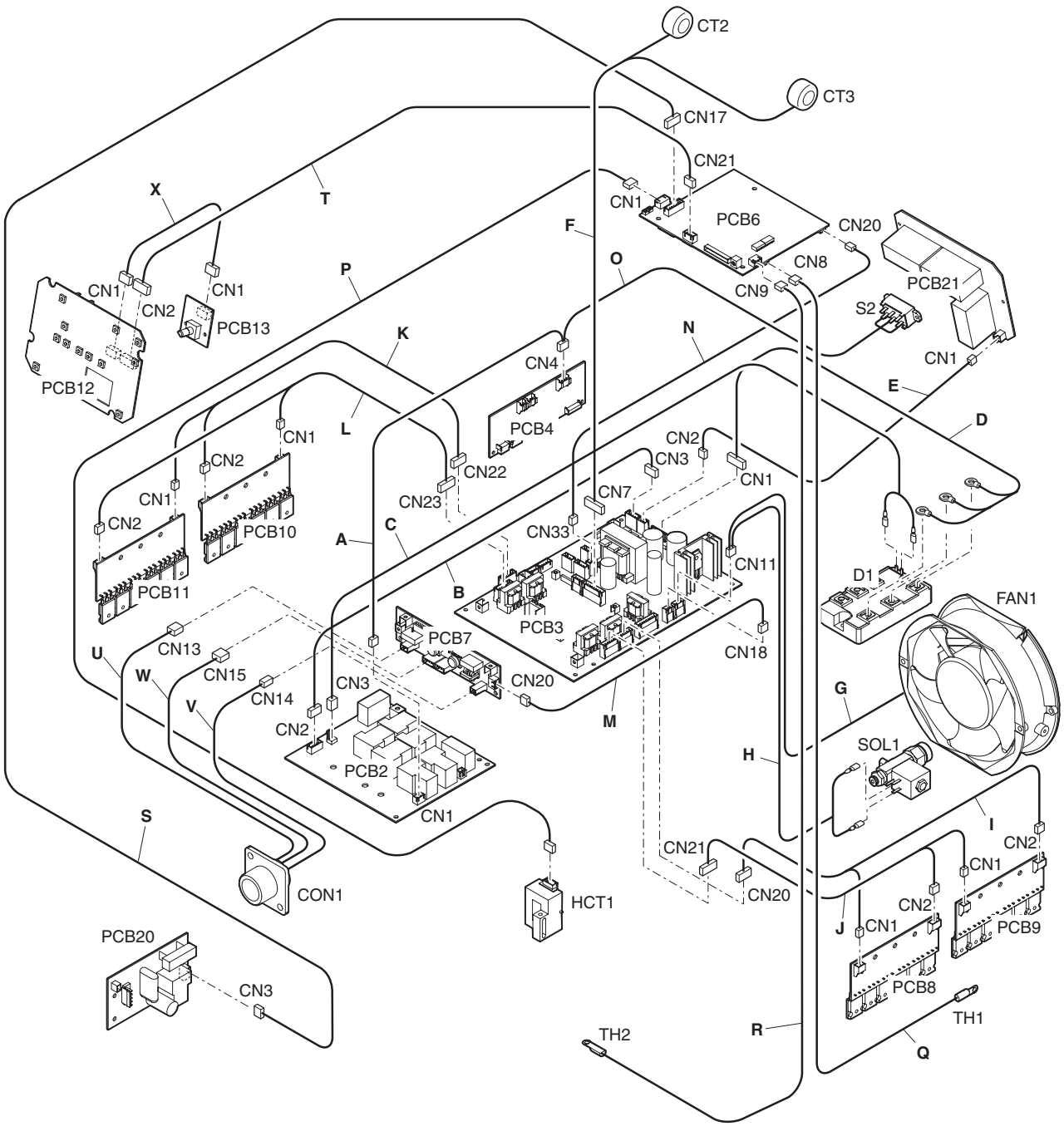
APPENDIX 2 CONNECTION WIRING GUIDE

	Destination				
A	PCB2	CN1	↔	PCB4	CN4
B	PCB2	CN2	↔	PCB3	CN3
C	PCB2	CN3	↔	D1	
D	PCB3	CN1	↔	D1	
E	PCB3	CN2	↔	PCB21	CN1
F	PCB3	CN7	↔	CT2	
				CT3	
G	PCB3	CN11	↔	FAN1	
H*				SOL1	
I	PCB3	CN20	↔	PCB8	CN1
J	PCB3	CN21	↔	PCB8	CN2
K	PCB3	CN22	↔	PCB10	CN1
L	PCB3	CN23	↔	PCB9	CN2
M	PCB3	CN18	↔	PCB7	CN20
N	PCB3	CN33	↔	PCB6	CN20
O	PCB4	CN4		S2	
P	PCB6	CN1	↔	HCT1	
Q	PCB6	CN8	↔	TH1	
R	PCB6	CN9	↔	TH2	
S	PCB6	CN17	↔	PCB16	CN4
				PCB20	CN3
T	PCB6	CN21	↔	PCB12	CN2
U	PCB7	CN13	↔	CON1	
V		CN14			
W		CN15			
X	PCB12	CN1	↔	PCB13	CN1

∗ 300/400TS only


CT2
CT3
CN17
CN21
CN1
PCB6
CN20
CN8
CN9
PCB21
S2
CN1
X
T
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P
K
N
E
D
L
CN4
PCB4
CN22
CN23
CN2
CN3
CN1
CN7
CN33
CN11
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C
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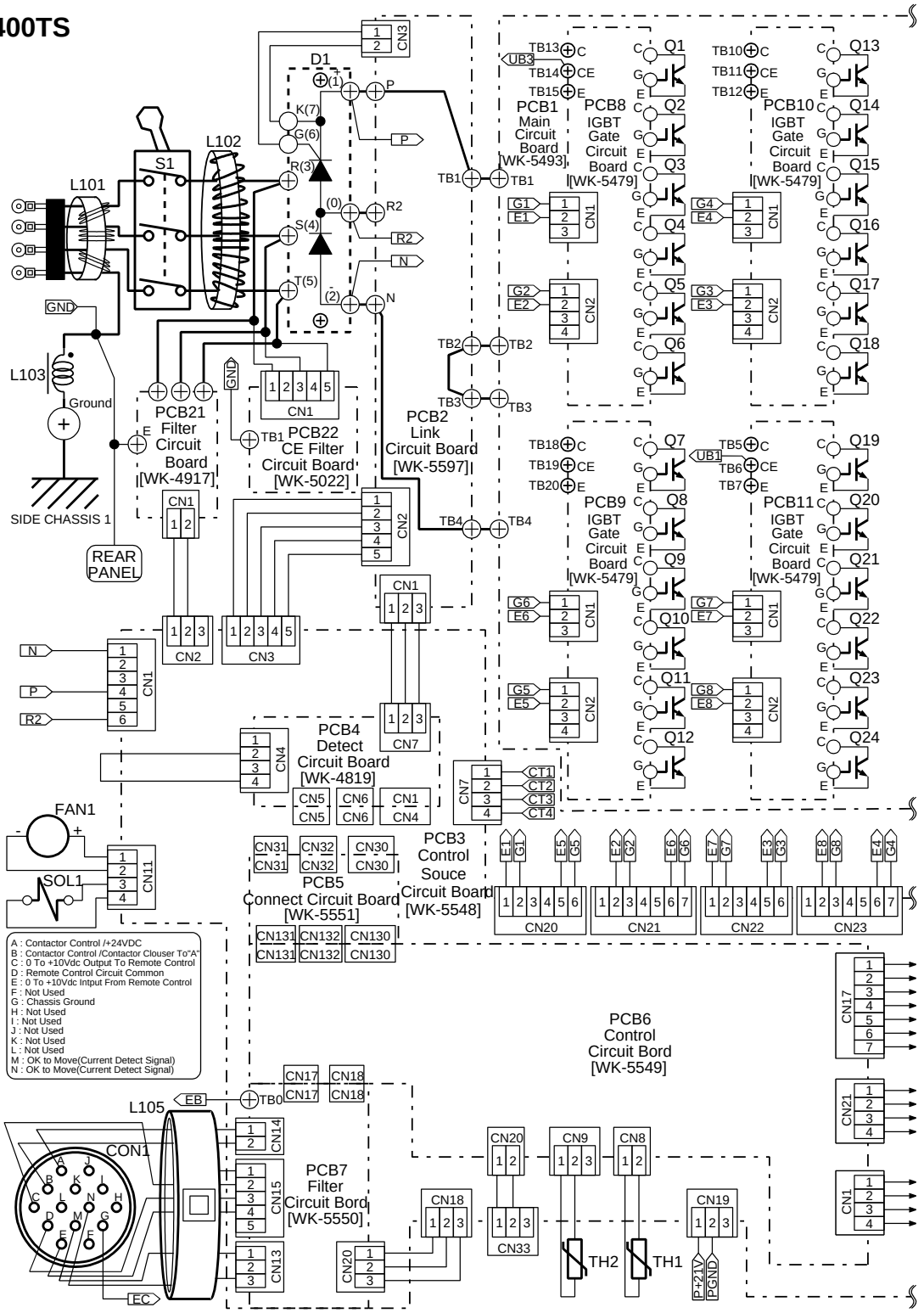
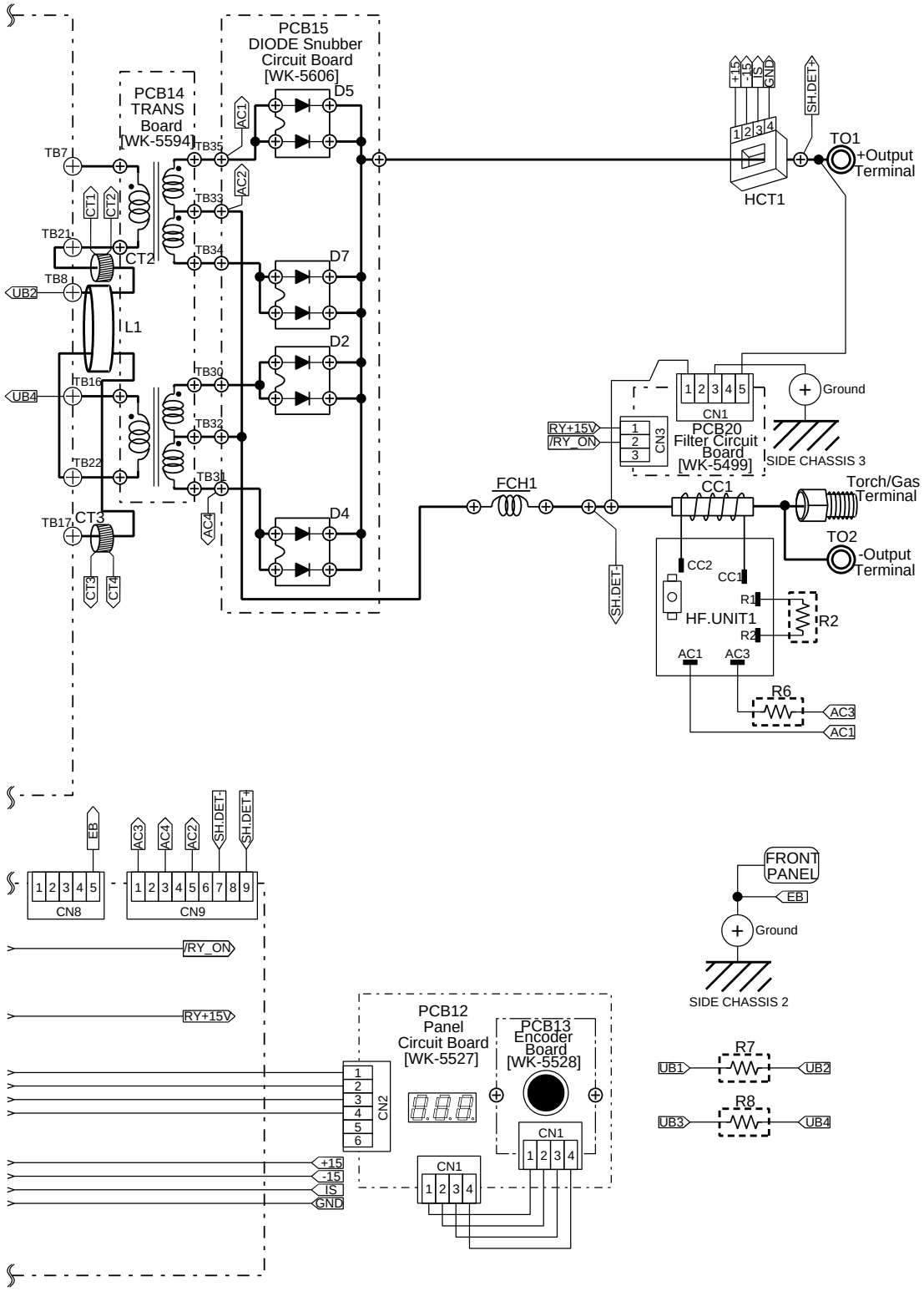
CN3
CN20
PCB7
M
CN2
PCB2
CN1
H
SOL1
I
S
CON1
HCT1
CN21
CN20
CN2
CN1
PCB9
J
CN1
CN2
PCB8
TH1
PCB20
CN3
TH2
R
Q
PCB12
CN1
CN2
PCB13
CN1
CN2
PCB10
CN1
CN2
PCB11

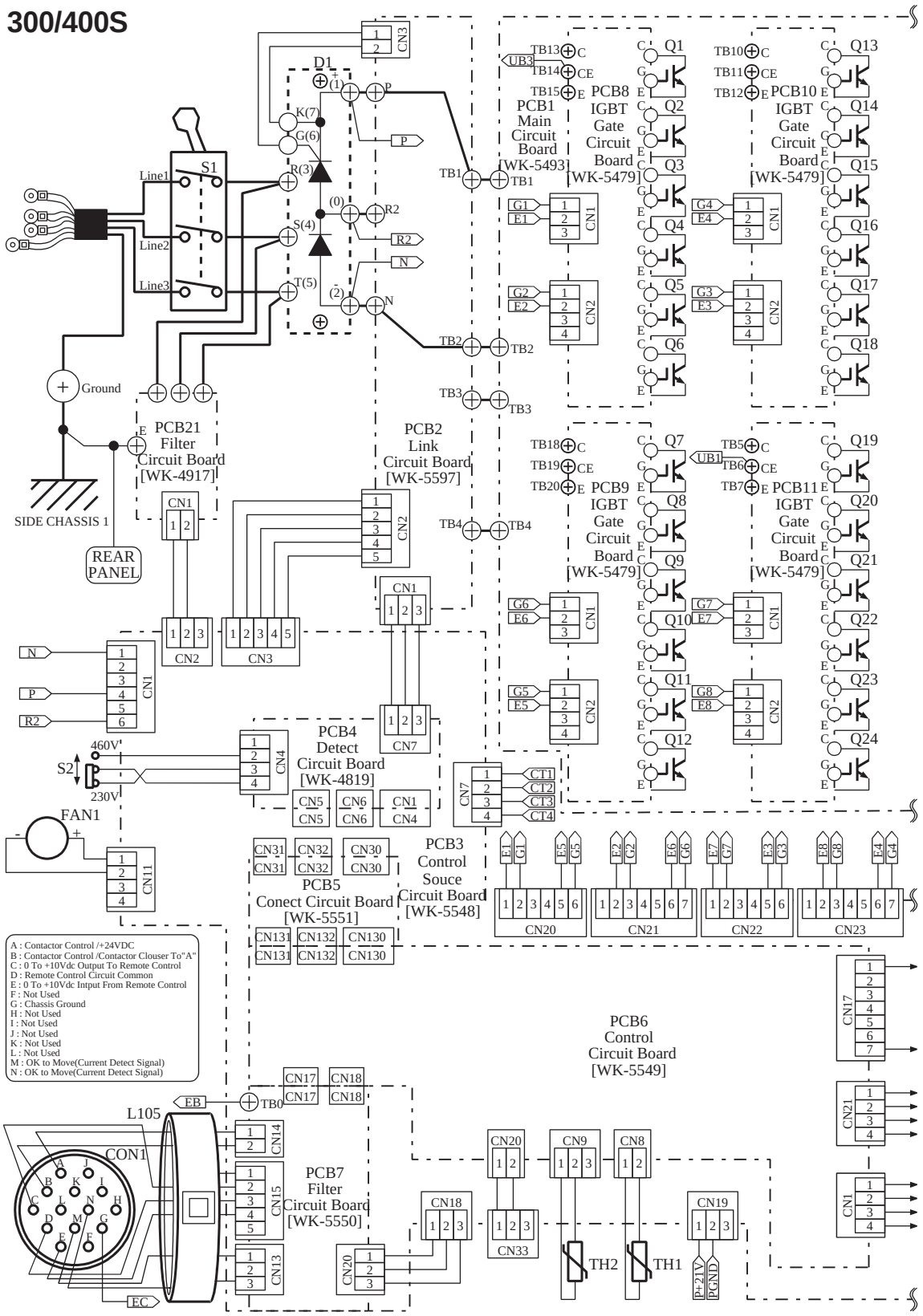
APPENDIX 3 INTERCONNECT DIAGRAM

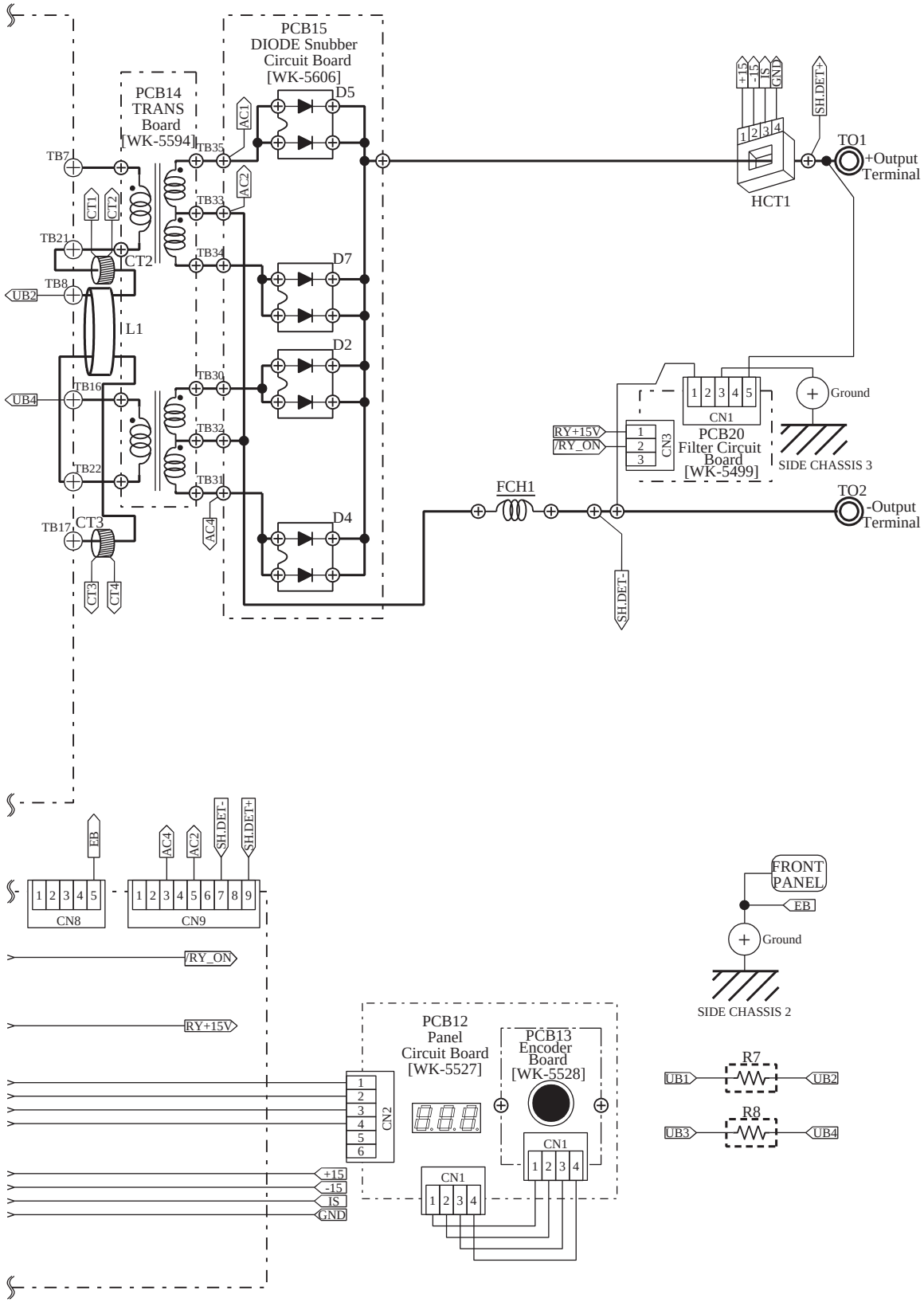
300/400TS


PCB1 Main Circuit Board [WK-5493]
PCB8 IGBT Gate Circuit Board [WK-5479]
PCB10 IGBT Gate Circuit Board [WK-5479]
PCB9 IGBT Gate Circuit Board [WK-5479]
PCB11 IGBT Gate Circuit Board [WK-5479]
PCB2 Link Circuit Board [WK-5597]
PCB21 Filter Circuit Board [WK-4917]
PCB22 CE Filter Circuit Board [WK-5022]
PCB4 Detect Circuit Board [WK-4819]
PCB3 Control Souce Circuit Board [WK-5548]
PCB5 Connect Circuit Board [WK-5551]
PCB6 Control Circuit Bord [WK-5549]
PCB7 Filter Circuit Bord [WK-5550]
D1
S1
L101
L102
L103
L105
FAN1
SOL1
CON1
TH1
TH2
Ground
SIDE CHASSIS 1
REAR PANEL
A : Contactor Control /+24VDC
B : Contactor Control /Contactor Clouser To"A"
C : 0 To +10Vdc Output To Remote Control
D : Remote Control Circuit Common
E : 0 To +10Vdc Intput From Remote Control
F : Not Used
G : Chassis Ground
H : Not Used
I : Not Used
J : Not Used
K : Not Used
L : Not Used
M : OK to Move(Current Detect Signal)
N : OK to Move(Current Detect Signal)


PCB15
DIODE Snubber
Circuit Board
[WK-5606]
PCB14
TRANS
Board
[WK-5594]
D5
D7
D2
D4
TB7
TB21
TB8
TB16
TB22
TB17
TB35
TB33
TB34
TB30
TB32
TB31
AC1
AC2
AC4
CT1
CT2
CT3
CT4
L1
UB2
UB4
+15
-15
IS
GND
SH.DET+
SH.DET-
HCT1
TO1
+Output
Terminal
TO2
-Output
Terminal
Torch/Gas
Terminal
FCH1
CC1
CC2
R1
R2
HF.UNIT1
AC3
R6
PCB20
Filter Circuit
Board
[WK-5499]
CN1
CN3
RY+15V
/RY_ON
Ground
SIDE CHASSIS 3
EB
CN8
CN9
FRONT
PANEL
SIDE CHASSIS 2
PCB12
Panel
Circuit Board
[WK-5527]
PCB13
Encoder
Board
[WK-5528]
CN2
R7
R8
UB1
UB3

300/400S INTERCONNECT DIAGRAM




PCB15
DIODE Snubber
Circuit Board
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PCB14
TRANS
Board
[WK-5594]
D5
D7
D2
D4
AC1
AC2
AC4
TB7
TB35
TB33
TB21
TB34
TB8
UB2
L1
TB16
TB30
UB4
TB32
TB22
TB31
TB17
CT1
CT2
CT3
CT4
+15
-15
IS
GND
SH.DET+
SH.DET-
HCT1
TO1
+Output
Terminal
TO2
-Output
Terminal
FCH1
RY+15V
/RY_ON
CN3
CN1
PCB20
Filter Circuit
Board
[WK-5499]
Ground
SIDE CHASSIS 3
EB
CN8
CN9
FRONT
PANEL
SIDE CHASSIS 2
R7
R8
UB1
UB3
PCB12
Panel
Circuit Board
[WK-5527]
PCB13
Encoder
Board
[WK-5528]
CN2

APPENDIX 4 DIODE TESTING BASICS

Testing of diode modules requires a digital Volt/ Ohmmeter that has a diode test scale.

1. Locate the diode module to be tested.
2. Remove cables from mounting studs on diodes to isolate them within the module.
3. Set the digital volt/ohm meter to the diode test scale.
4. Using figure 1 and 2, check each diode in the module. Each diode must be checked in both the forward bias (positive to negative) and reverse bias (negative to positive) direction.
5. To check the diode in the forward bias direction, connect the volt/ohm meter positive lead to the anode (positive, +) of the diode and the negative lead to the cathode (negative, –) of the diode (refer to Figure 13-1). A properly functioning diode will conduct in the forward bias direction, and will indicate between 0.3 and 0.9 volts.
6. To check the diode in the reverse bias direction, reverse the meter leads (refer to Figure 13-1). A properly functioning diode will block current flow in the reverse bias direction, and depending on the meter function, will indicate an open or "OL".
7. If any diode in the module tests as faulty, replace the diode module.
8. Reconnect all cables to the proper terminals.

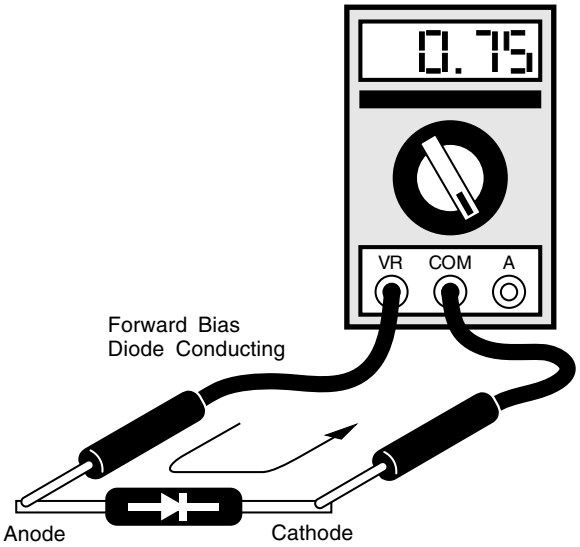

Figure 13-1: Forward bias diode test

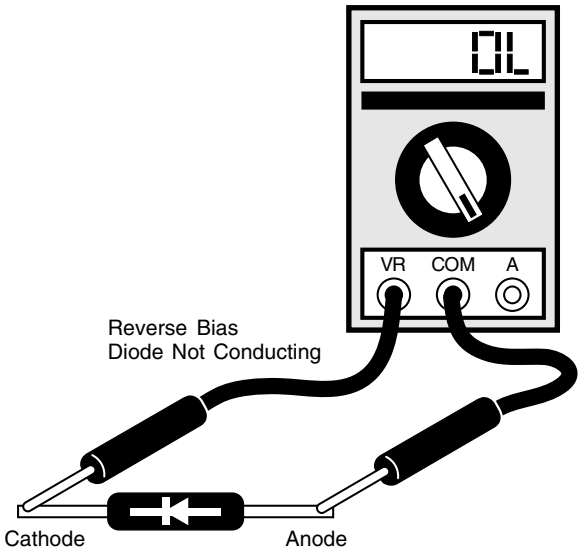

Figure 13-2: Reverse bias diode test

LIMITED WARRANTY AND SCHEDULE

This information applies to Thermadyne products that were purchased in the United Kingdom

April 2006

Thermadyne guarantees the proposed product to be free from defects in material or workmanship when operated in accordance with the written instructions as defined in the owner's manual supplied with the machine. Thermadyne welding products are manufactured for use by commercial and industrial users and trained personnel with experience in the use and maintenance of electrical welding and cutting equipment.

Thermadyne warranty will not apply to:

1. Equipment that has been modified by any other party other than Thermadyne's own service personnel or with prior written consent obtained from Thermadyne service department (UK).
2. Equipment that has been used beyond the specifications established in the owners manual.
3. Installation not in accordance with the installation/service manual.
4. Failure to clean and maintain the machine as set forth in the owner, installation or service manual.

If warranty is being sought, please contact Thermadyne's UK warranty department for a warranty authorization returns form.

Welding Equipment - Limited Warranty Period	
Product	**Period**
200S, 300S, 400S, 200TS, 300TS, 400TS, 400 MST, 200AC/DC, 300AC/DC, PowerMaster 320SP, 400SP, 500SP, Fabricator 200, Ultrafeed VA4000, Portafeed VS212	3 Years
150SE, 155SE, 250SE, 400SE, 250TE, 400TE, 180AC/DC, 250AC/DC, 400AC/DC Fabricator 250, Fabricator 330, Fabricator 400, Fabricator 450, 220GMS	2 Years
Options and Accessories	6 Months
Repair and Replacement Parts	3 Months
Torch Consumables	None
Cutting Equipment -Limited Warranty Period	
Product	**Period**
CutMaster 38, 51, 81,101, 151	3 Years
PakMaster 150XL, Drag-Gun Plus	2 Years
CutSkill C-35A, C-70A, C-100A, Drag-Gun	1 Year
1TorchTM, SureLokTM Torches and PCH 120	1 Year
Other Torches	6 Months
Repair Parts	3 Months
Arc Accessories - Limited Warranty Period	
Product	**Period**
All Products	1 Month
Consumables	None
Torch Consumables	None

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